THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LVII. No. 1459.] LONDON, APRIL 28, 1891. [43RD YEAR. Price 6d.

WOLSTON'S Paste and Ready Mixed for Use.
Guaranteed Free from Adulteration. **TORBAY PAINTS.**
FOR GASHOLDERS, &c., &c.
The Original "Torbay Paints"
As supplied during the present and many preceding years to the LONDON GASLIGHT & COKE COMPANY.
Special Quotations to Gas Companies.
TORBAY & DART PAINT Co., Ld.,
23, Gt. George St., Westminster, S.W.
Works: DARTMOUTH, DEVON.

— ESTABLISHED 1830. —
PARKER & LESTER,
Manufacturers & Contractors.
THE ONLY MAKERS OF
PATENT ANTIMONY PAINT,
Parker's Imperial Black Varnish,
Oxide Paints, Oils, and General Stores for Gas and Water Works.
WORKS:
ORMSIDE STREET, OLD KENT ROAD, LONDON.
Ashmore, Benson, Pease, & Co., Ld.,
STOCKTON-ON-TEES,
Manufacturing Gas Engineers.
See Advertisement, p. 814.

CEMENT
EARLE'S
BEST
Portland Cement
MANUFACTURED BY
GEO. & THOS. EARLE,
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Office: 7, PIER STREET.
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STOREAGE CAPACITY 10,000 Tons.
ESTABLISHED 1811—OVER THREE QUARTERS OF A CENTURY.
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Manufacturers & Patentees of every Description of
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FOR
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We specially solicit Government and Local Board Contracts for General Lighting.

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MANUFACTURERS OF THE WELL-KNOWN
SELF-CONTAINED DUST-FUEL FURNACES,
Have REMOVED from 26, HALF STREET,
TO
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MANUFACTURER OF TELESCOPIC AND SINGLE GASHOLDERS,

WROUGHT AND CAST IRON TANKS FOR DITTO,

PURIFIERS, CONDENSERS, SCRUBBERS, HYDRAULIC MAINS, and all kinds of GAS APPARATUS,

Wrought-Iron Roofs, Bridges, Girders, &c.,

Steam, Hot Water, and Range Boilers, Tanks, Cisterns, Boats, and all kinds of Wrought-Iron Work.

DRAWINGS, SPECIFICATIONS, AND ESTIMATES SUPPLIED ON APPLICATION.

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EDWARD COCKEY & SONS, Ld.,

ESTABLISHED OVER HALF A CENTURY.

Gas Engineers and Contractors for the Erection of Gas-Works.

MANUFACTURERS OF IMPROVED GAS-EXHAUSTING APPARATUS.

A Large Stock of Valves always on hand.

Lamp Columns; various patterns.

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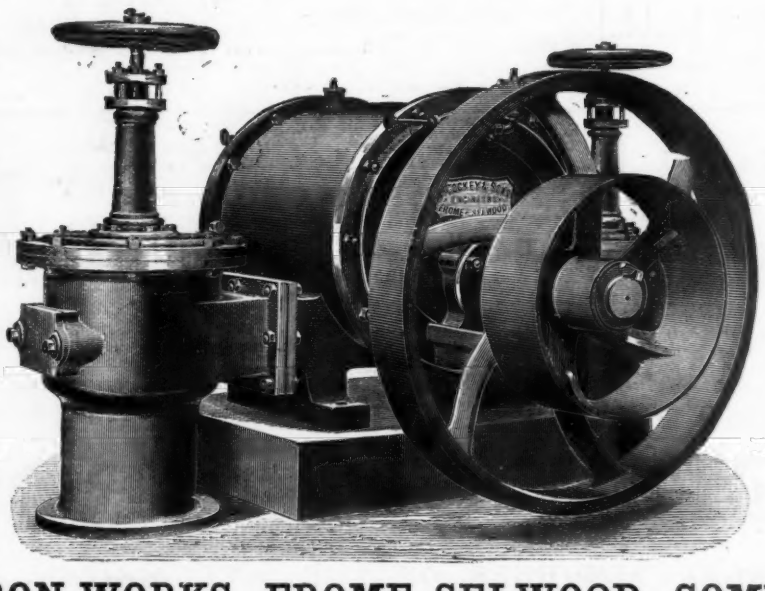
Castings of every description.

Apparatus for the manufacture of Sulphate of Ammonia.



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Gas-Fittings in great variety.

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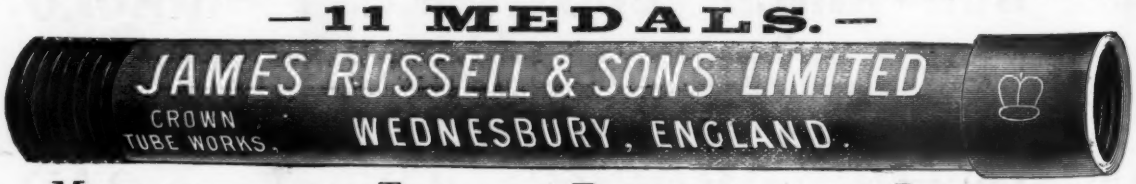

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WROUGHT-IRON OR STEEL MAINS UP TO 6 FEET DIAMETER, FOR GAS, WATER, OIL, OR OTHER PURPOSES.

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SPENT LIMES NO LONGER WASTE PRODUCTS.

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All Spent Limes are most effectually, economically, and continuously recovered, and at from one-third to one-half the cost of New Lime. The results are a surprise to all who have inspected the process, and are entirely satisfactory to all now using it. Descriptive Pamphlet and Terms from Agents as under.

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Illustrated Pamphlet and Terms on application to J. E. FISHER, Stourbridge, Agent for England and Wales; to C. M. HAMILTON, Portland Place, Hamilton, Agent for Scotland and Ireland; and for all other Countries to the Patentee,

Geo. R. HISLOP, Gas Engineer, PAISLEY, N.B.

FIRE BRICKS,
LUMPS, TILES,
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Special Bricks for Intense Heats.

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CASTINGS AND EVERY REQUISITE FOR GAS-WORKS.

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☞ Retort Setters sent to any part of the Kingdom.

ESTABLISHED 1825.

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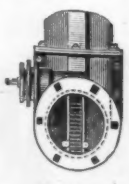

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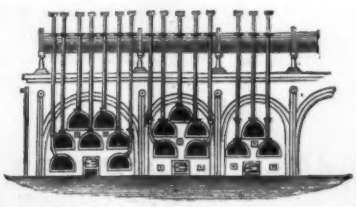
Iron Roofs, Columns, Girders, Floor Plates and Tools, &c.



WROUGHT AND CAST IRON CONDENSERS, SCRUBBERS, & WASHERS,

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PATENT CENTRE VALVES

for working Purifiers.

Also Bye-Pass & Stop Valves.

PURIFIERS with Planed Joints,

HAND and HYDRAULIC LIFTING GEAR, CAST-IRON MAINS and SPECIALS,

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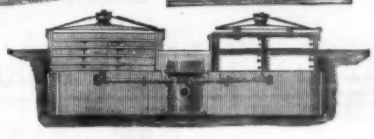

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Pig Iron (*Special Quality*) for ENGINE CYLINDERS, &c.

GAS COAL FAMOUS FOR ITS UNRIVALLED EXCELLENCE.

CROSSLEY'S "OTTO" GAS-ENGINE.

100 Prize Medals.

MADE in SIZES
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GAS-ENGINES
COMBINED
WITH
PUMPS
FOR
TOWNS SUPPLY,
SEWAGE, &c., &c.

GAS-ENGINES
COMBINED
WITH
AIR COMPRESSORS
FOR THE
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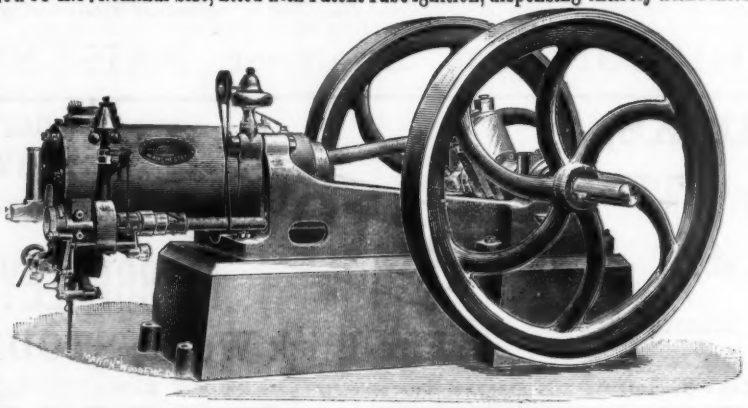
SYSTEM, LUCIGEN
LIGHT, &c.

New 14-H.P. Nominal Size, fitted with Patent Tube Ignition, dispensing entirely with Plates.



MADE in SIZES
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VERTICAL
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TYPES.

ENGINES
COMBINED
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HOISTS, PUMPS
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Largely used for
EXHAUSTING,
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Over **31,000** "OTTO" ENGINES are at work.

CROSSLEY BROS., LTD., OPENSHAW, MANCHESTER,

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NEWCASTLE,
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FIRE-CLAY GAS-RETORTS, FIRE-BRICKS, LUMPS, & TILES of Every Description.

GLAZED BRICKS AND PORCELAIN BATHS.

SAML. CUTLER & SONS, Engineers,

GAS AND WATER WORKS CONTRACTORS.

EVERY REQUIREMENT FOR RETORT-HOUSES.

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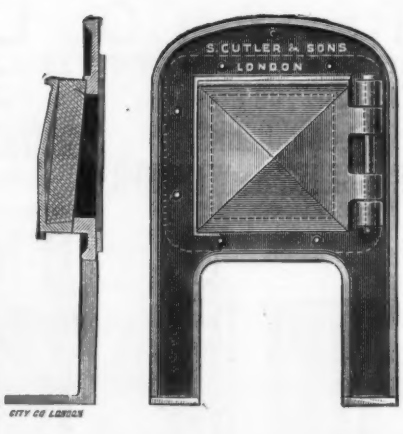
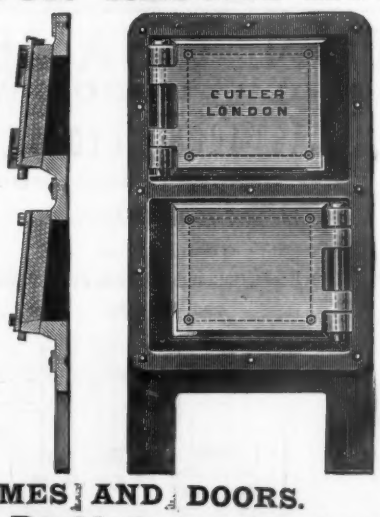
ASCENSIONS.
ARCH
DIPS.
HYDRAULIC
MAINS.
SEAL VALVES.





BUCKSTAVES.
TIE-RODS.
FURNACE
FITTINGS.
RAKES.
SHOVELS.
SCOOPS.

STOCK FURNACE FRAMES AND DOORS.

Single Door, opening 12 in. by 12 in.
do. „ 10 in. „ 10 in.

Double Door, openings 12 in. by 10 in.
do. „ 10 in. „ 10 in.

STEEL CHARGING SCOOPS.

FIG 21
IN ORDERING STATE SIZE AND LENGTH OF RETORT.

WORKS:
PROVIDENCE IRON-WORKS, MILLWALL, LONDON, E.
Telegrams: "CUTLER, MILLWALL, LONDON." *Telephone:* 5059.

OFFICES:
16, GT. GEORGE STREET, WESTMINSTER, S.W.
Telegrams: "RETORTUS, LONDON." *Telephone:* 3223.

A.B.C. CODE USED, 4TH EDITION 1883.

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INCORPORATED IN
THE LEEDS FIRE-CLAY COMPANY, Ltd.,
WORTLEY, LEEDS.

LONDON Offices & Depôts:
Baltic Wharf, Waterloo Bridge.
WHARVES NOS. 2 & 4, INSIDE G.N. GOODS YARD, KING'S CROSS, N.
LIVERPOOL:
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MACHINE-MADE RETORTS

Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

RETORTS CAREFULLY PACKED FOR EXPORT.

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ESTABLISHED MORE THAN A QUARTER OF A CENTURY

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LONDON OFFICE: 60, QUEEN VICTORIA STREET E.C.

CLAYTON SON & CO. LTD.

MAKE A SPECIALTY OF GASHOLDERS

AND MAKERS OF GAS PLANT OF EVERY DESCRIPTION.

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Proprietors of

ALDWARKE MAIN CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.

ALDWARKE MAIN GAS COAL

Analysis: 12,600 feet of 19-candle gas per ton.
Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.
Telegrams: "ATLAS SHEFFIELD."

THOMAS PIGGOTT & CO., BIRMINGHAM.

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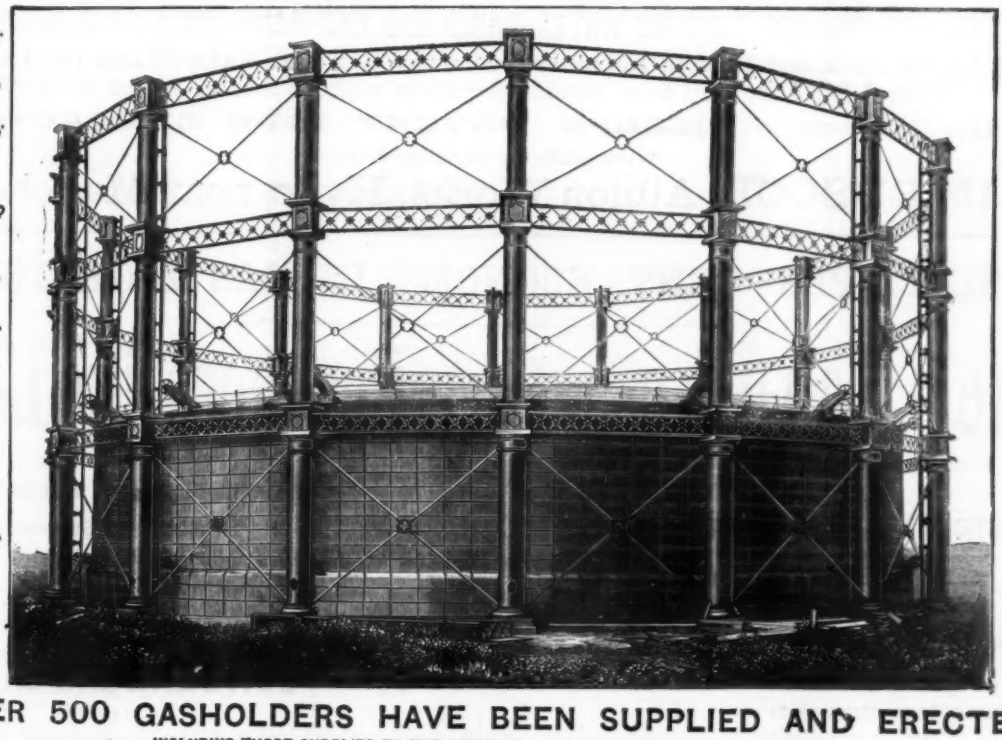
GAS PLANTS, BOILERS, ENGINES, PUMPS, ROOFS, RETORT FITTINGS, ETC.



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WELDED & RIVETED PIPES, FOUL MAINS, RETORT LIDS, WROT & CAST TANKS, PURIFIERS.

OVER 500 GASHOLDERS HAVE BEEN SUPPLIED AND ERECTED,

INCLUDING THOSE SUPPLIED TO THE FOLLOWING GAS COMPANIES AND CORPORATIONS:

BATH.	BOLTON.	BRISTOL.	CHELTENHAM.	LEAMINGTON.	PRESTON.	SHEFFIELD.
BELFAST.	BOMBAY.	BRISBANE.	HARTLEPOOL.	LIVERPOOL.	READING.	STOCKHOLM.
BECKTON.	BRADFORD.	CARDIFF.	LEEDS.	NOTTINGHAM.	RIO GRANDE.	SYDNEY.
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JOHN HALL & CO.,

STOURBRIDGE,

MANUFACTURERS OF FIRE-BRICKS, LUMPS, TILES,

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.

RETORTS CAREFULLY PACKED FOR SHIPMENT.

A STOCK OF DIFFERENT SHAPES ON HAND.

GAS AND WATER PIPES

AND

CASTINGS OF EVERY DESCRIPTION.

MANUFACTURED BY THE

CLAY CROSS COMPANY,

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TRADE	TELEGRAMS:	LONDON AGENTS:
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MARK.	CLAY CROSS.	130, GT. SUFFOLK ST., S.E.

SULPHATE OF AMMONIA.

By Her Majesty's Royal Letters Patent.

DR. FELDMANN'S APPARATUS

The most successful and approved Apparatus known up to the present time.

FOR REFERENCES, PARTICULARS, TESTIMONIALS, AND PRICES APPLY TO THE

Sole Agents and Manufacturers,

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ENGINEERS,

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The Apparatus has been supplied to the following Firms–

BURT, BOULTON, & HAYWOOD, SILVERTOWN, and ELING.
CHANCE BROTHERS, OLDBURY (4 Apparatus).
RUNCORN SOAP & ALKALI CO., Limited, RUNCORN.
NETHAM CHEMICAL CO., Limited, BRISTOL.
ANIMAL CHARCOAL CO., Limited, SHADWELL.
WM. BUTLER & CO., BRISTOL.
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ILKESTON.	BURY.	CHORLEY.
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		HAMPTON COURT.

RUSCOE'S PATENT MACHINE

FOR DRILLING AND TAPPING WATER-MAINS AND GAS-MAINS UNDER PRESSURE.

Patent Saddle Back and Drilling Apparatus, whereby Gas and Water Mains can have 2-in., 3-in., 4-in., 5-in., and 6-in. Branches put on without loss of Water or Gas.

Sole Maker of HELPS' PATENT PIPE EXTRACTOR.

Prices and Particulars on Application to

JOHN RUSCOE, Albion Works, Hyde, near Manchester.

SIXTY PER CENT. ECONOMY IN GAS LIGHTING.

The Schülke Regenerative Lamp

FOR

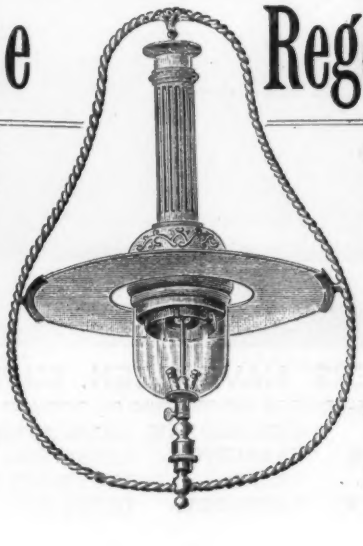
DOMESTIC AND EXTERNAL LIGHTING.

The only Regenerative Lamp employing the Common Flat-Flame Burners.

Lamps giving 20-Candle power consume less than four feet of Gas per hour.

PURE WHITE & PERFECTLY STEADY LIGHT,

NOT AFFECTED BY DRAUGHTS.



Suitable for any existing fittings (Brackets or Suspending).

Can be fixed in a few minutes.

May be seen at the Offices of the

SCHÜLKE GAS-LAMP Co.

LIMITED,

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LONDON, W.C.,

Where Price Lists and full particulars may be obtained.

KIRKHAM, HULETT, & CHANDLER'S, LTD.,

[SIDNEY HERSEY, Managing Director.] **NEW PATENT** [J. CHANDLER, Engineer.]

"STANDARD" WASHER-SCRUBBERS

Have now been supplied to the following Gas Companies and Corporations: The Gaslight and Coke Company; Liverpool, West Ham, Derby, Cambridge, Lowestoft, and Melbourne Gas Companies; Manchester, Glasgow, Rochdale, Workington, Rawmarsh Corporations, &c., &c., &c.

Original pattern "STANDARD" Washer-Scrubbers have been altered and improved—by the Company's new patent Washing Devices ("Bundles") being fitted—at the following Gas-Works: The Gaslight and Coke Company's Beckton, Nine Elms, Shoreditch, Pimlico, and Bromley Stations; Birmingham, Nottingham, Edinburgh, West Ham, Melbourne, Croydon, Maidstone, Harrow, Buxton, Kingston-on-Hull, &c., &c., &c.

THESE IMPROVED "BUNDLES" ARE CONSTRUCTED CHIEFLY OF WOOD AND TO TEMPLATES OF ORIGINAL IRON "BUNDLES," AND CAN BE EASILY FITTED IN PLACE OF THE LATTER BY UNSKILLED LABOUR.

ADDRESS: **PALACE CHAMBERS, BRIDGE STREET, WESTMINSTER, S.W.**

R. & J. DEMPSTER,

GAS PLANT WORKS, NEWTON HEATH, MANCHESTER,

MAKERS AND ERECTORS OF

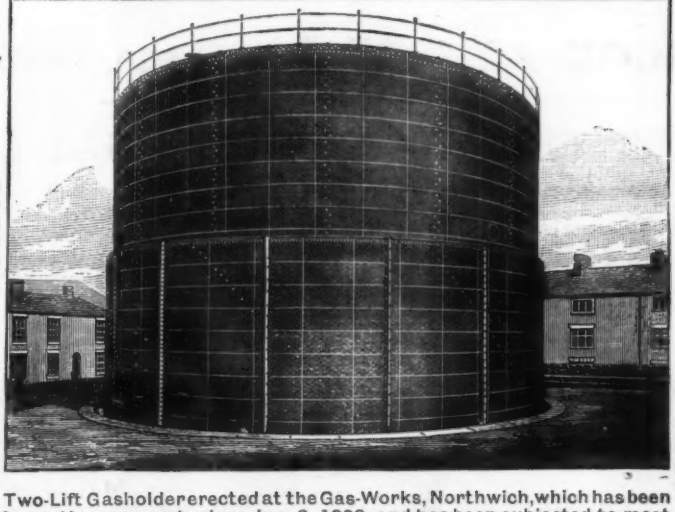
PATENT COLUMNLESS GASHOLDERS.

Telegraphic Address: "SCRUBBER MANCHESTER."

TOTAL WEIGHT REDUCED from 30 per cent. to 50 per cent.

TRANSPORT AND ERECTION REDUCED to the same extent; and in cases where gasholders are shipped abroad to places difficult of access, this represents a very large amount of money.

TANK CONSTRUCTION SIMPLIFIED. The Tank wall (of whatever construction) is a regular cylinder. There are no piers needed, and all expensive foundation stones for the base of columns or standards are dispensed with.



Two-Lift Gasholder erected at the Gas-Works, Northwich, which has been in continuous work since Jan. 3, 1890, and has been subjected to most severe tests from heavy gales, with perfectly satisfactory results.

COST OF PAINTING SAVED for the Columns and Girders.

TILTING UTTERLY IMPOSSIBLE; And as there are fewer parts, there is less liability for the Gasholder to get out of order in working.

STABILITY UNDER WIND PRESSURE of a Gasholder constructed upon this system is at least equal to, and from experiments and calculations made is far in excess of, that of a Holder of the same dimensions guided by the elaborate guide framing at present in use.

The removal of heavy guide carriages and rollers from the top curbs considerably lowers the centre of gravity of the structure, and dispenses with the extra strength of sheeting necessary to carry these at the points where they are attached to the gasholder.

The plan adapts itself to telescoping to any reasonable extent, and enables very shallow holders or lifts to be employed with perfect stability.

FOR FURTHER PARTICULARS AND ESTIMATES, APPLY TO THE ABOVE.

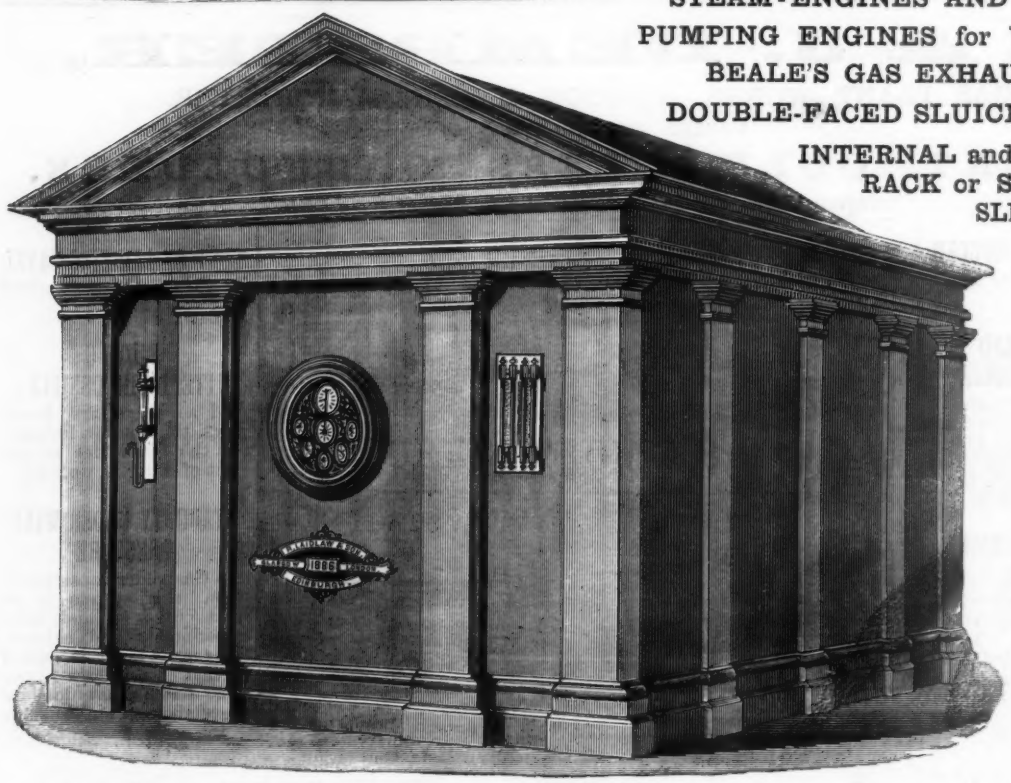
R. LAIDLAW & SON'S
STATION METERS
IN ROUND OR SQUARE CASES, ALL SIZES.

Makers in EDINBURGH of

WET AND DRY GAS-METERS,
IMPROVED STATION GOVERNORS,
PRESSURE REGISTERS,
(To Indicate New Time),
PRESSURE GAUGES, TEST HOLDERS,
EXPERIMENTAL HOURLY-RATE METERS,
EXPERIMENTAL TEST-METERS,
CONDENSER THERMOMETERS,
SIEMENS' WATER-METERS,
STREET LANTERNS,
AND ALL KINDS OF
GAS APPARATUS AND FITTINGS, &c.

Makers in GLASGOW of

CAST-IRON PIPES (all Sizes),
LAMP PILLARS,
STEAM-ENGINES AND BOILERS,
PUMPING ENGINES for Water-Works,
BEALE'S GAS EXHAUSTERS,
DOUBLE-FACED SLUICE VALVES,
INTERNAL and EXTERNAL RACK or SCREW SLIDE VALVES,
CAST-IRON COLUMNS,
BEAMS, GIRDERS, and WATER TANKS.
WROUGHT-IRON TUBES, FITTINGS, &c.



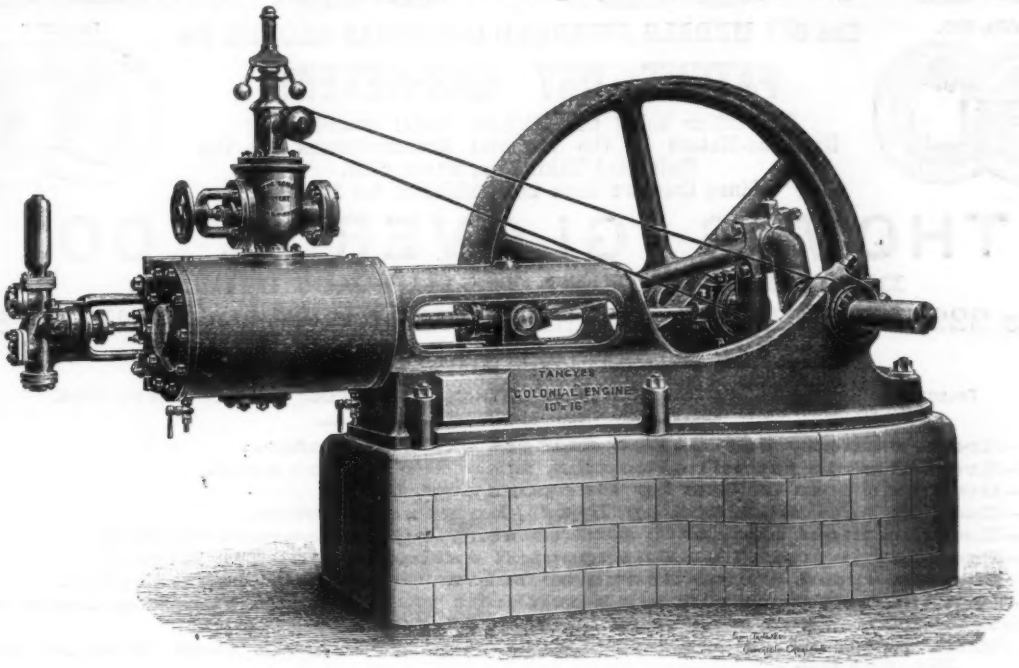
Descriptive Price Lists, Estimates, & full particulars forwarded on application.

ALLIANCE FOUNDRY, **GLASGOW.** | SIMON SQUARE WORKS, **EDINBURGH.** | 6, LITTLE BUSH LANE, **LONDON, E.C.**

TANGYES

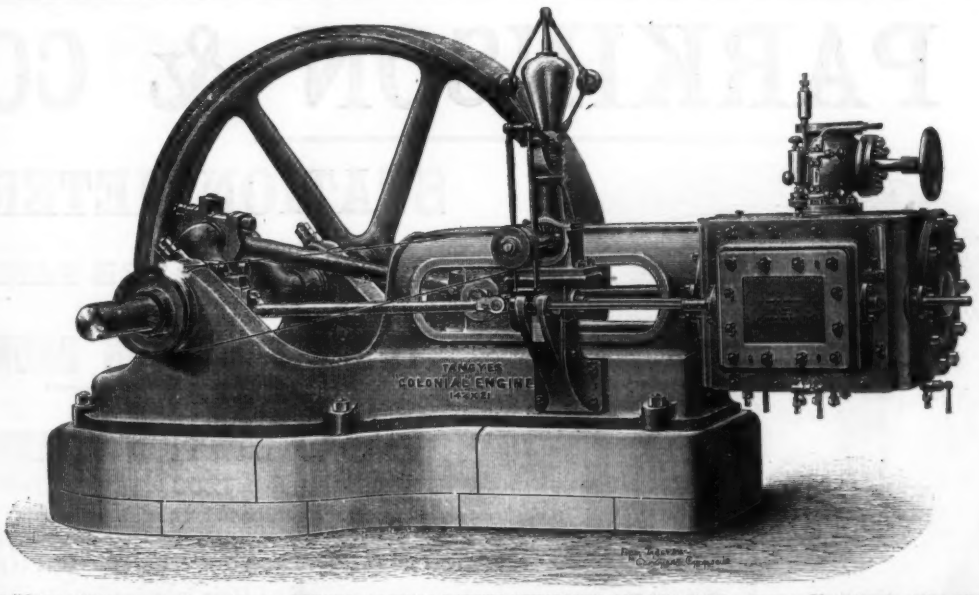
"COLONIAL" STEAM-ENGINE

Constructed for Steam Pressures up to 100 lbs. per square inch.



From a Photograph of the 10 in. by 16 in. size, with Feed Pump.

Steam Cylinder, diam. .. ins.	4½	5½	6½	7½	8	9	10	12	14½
Stroke, length .. .. .. "	7	8	9	9	12	14	16	18	21
Revolutions .. .. per min.	250	225	200	200	150	140	125	116	100



Tangyes "Colonial" Steam-Engine, with the TANGYE-JOHNSON PATENT AUTOMATIC CUT-OFF GEAR. From a Photograph of the 14½ in. by 21 in. size.

Steam Cylinder, diam. .. .. ins.	8	9	10	12	14½
Stroke, length .. .. .. "	12	14	16	18	21
Revolutions .. .. .. per min.	150	140	125	116	100

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TO CORRESPONDENTS.

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THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, APRIL 28, 1891.

The Programme of the Incorporated Institution of Gas Engineers.

THE report of the Council of the Incorporated Institution of Gas Engineers has been issued, together with the formal notice to members of the special general meeting, which is to be held at the Institution of Civil Engineers, Westminster, on Tuesday and Wednesday, the 12th and 13th prox., under the presidency of Mr. G. C. Trewby, M. Inst. C.E. The report refers to the holding of the statutory annual general meeting in February, when the position of the Institution was fully stated. Certain formal matters remain to be attended to at the forthcoming meeting, however; among them being the appointment of three Trustees and a Secretary. Messrs. Trewby, William King, and Foulis have consented to be nominated for the former office; and, as already announced in the JOURNAL, the Council have secured the services of Mr. Thomas Cole, Assoc. M. Inst. C.E., Secretary to the Incorporated Association of Municipal and County Engineers, as Secretary to the Institution. There is to be an autumn meeting in Liverpool, on Tuesday and Wednesday, Oct. 13 and 14. The inaugural dinner will be held at the Holborn Restaurant on the evening of the first day of the meeting; and with this addition the two days will be wholly devoted to business. After the delivery of the President's address, Mr. A. C. M'Minn's paper on "The "Installation of Inclined Retorts and Labour-Saving Ap-"pliances in connection therewith" will be taken on Tuesday morning; and the afternoon will, by permission of The Gaslight and Coke Company, be devoted to the inspection of their Kensal Green station, where the matters treated of in Mr. M'Minn's paper will be seen in execution, together with the many other interesting and instructive points of gas engineering mentioned in the description of the station that appeared in the JOURNAL for Dec. 2 last (p. 1135). Next day will begin with the discussion of Mr. M'Minn's paper in the light of the subsequent object-lesson, which strikes one as a particularly happy arrangement. After this two papers, on water gas, by Messrs J. Goulden and A. G. Glasgow respectively will be read and discussed. The other papers are on "Purification," by Mr. Charles Hunt; on "The Leicester Gas-Works Extension," by Mr. A. Colson; and "Some Notes on the Use of Oil as a "Substitute for Cannel," by Mr. W. Foulis. The paper we announced as having been promised by Professor Vivian B. Lewes will not be given; but he will reserve himself for the Liverpool meeting. It is the intention of the Council to print the papers beforehand, so that any member can obtain, by applying to the Honorary Secretary (Mr. J. L. Chapman, of Harrow), an advance print of any contribution in which he may be interested. We understand that thoroughly good discussions are the aim of the Council in regard to the meetings of the Institution; and, accordingly, every available means will be adopted for securing this result. The report of the Council also gives the names of the members of the Institution, and publishes the accounts up to date, from which it appears that the revenue is already sufficient to clear off all the preliminary and incorporation expenses, and to show a balance of £43 12s. 1d. of income over expenditure.

In thus drawing attention to the preparations made for the first business meeting of the Institution of Gas Engineers, we have to congratulate the Council upon the attractive programme they have been able to submit as the first-fruits of the working of their organization. We call the *agenda* an attractive one; and it must be admitted that if the most modern technical matter, handled by professional writers whose position and experience warrants them in speaking with much authority upon their selected subjects, constitutes good business for a meeting of gas engineers, then this Institution programme is entitled to be so described. Every contributor is a gas engineer, and the subjects are well distributed over the range of gas engineering interest. If the Institution can keep up to this form, its future is assured. If there were twenty national Gas Managers' Associations in the land, there would be room for a society which could produce such fresh and solid professional fare. It will be noticed that there is no mention of any pleasure excursion in connection with this meeting; and we shall not misinterpret the intent of its organizers if we remark that nobody who desires other attractions than the official programme offers will be welcomed to this gathering. At great cost, and with infinite trouble, which need not be further discussed upon this occasion, one gathering of British Gas Engineers from all parts of the kingdom, for mutual instruction and encouragement, has now been cut free from accidental associations, and placed upon the footing of a strictly professional and technical assembly. It remains to be proved whether there is sufficient seriousness in the representatives of gas engineering in this country to justify this new departure.

The Carlisle Meeting of The Incorporated Gas Institute.

THE Council of The Incorporated Gas Institute met last Wednesday, at the offices in Westminster, under the presidency of Mr. J. Hepworth. A very favourable account

was given as to the prospects of the Carlisle meeting, at which instruction and entertainment are to be blended in a quite exceptional way; and we are fully persuaded that if this by no means easy task is to be satisfactorily performed, Mr. Hepworth is the man to do it. In the matter of papers, there is already an almost embarrassing profusion of promises; so that the contemplated subdivision of the meeting into sections is almost certain to be required. Though the titles of the papers are not yet absolutely fixed, and the arrangements with the authors are in some cases not sufficiently matured to enable their names to be published, we are in a position to give our readers a fairly comprehensive statement on the subject. Thus it may be regarded as settled that Mr. Chester, of Nottingham, will contribute a paper on the working-up of residuals by gas manufacturers; Mr. W. J. Warner will give a theoretical and practical demonstration of gas measurement; Professor Vivian B. Lewes will discourse upon carburetting gas with oils; and Professor W. Foster will give an analytical paper. Mr. A. T. Walmisley, a well-known constructor of works in iron, will expound his specialty; Mr. Ritson, of Jersey, will describe the management of a gas-works in connection with a localized residuals market; a paper will be contributed by a gas manager who has had close and practical experience of competition with electric light; and the subject of strikes will in all probability be brought forward by an officer of a Northern undertaking which has passed through the ordeal. Mr. C. S. Ellery, of Bath, and Mr. J. M'Gilchrist, of Dumbarton, may also be expected to furnish papers; and two or three more may be forthcoming at the proper time. So much for the technical part of the Carlisle programme, which must be regarded to be ample, varied, and most promising of interest.

As to the other order of Carlisle engagements, it is reported that the Institute will be welcomed to the old Border City by the Mayor and Corporation in state; and, in addition, the municipal authorities will entertain the members at a smoking concert and a *conversazione*. The President will personally arrange an afternoon excursion to Naworth Castle, a historic stronghold of the Northern Border; and on the Friday there will be a trip to Keswick. In addition to these engagements, the Manchester District Institution and the North of England Association have each determined to show hospitality to their brethren assembled in Carlisle. The latter Association came to this decision at their meeting last Saturday, which was attended by Mr. Hepworth, who took the opportunity of re-asserting his desire, and the intention of his Council, to make the Carlisle meeting of the Institute a starting-point for a new career, in which, while maintaining all worthy traditions of good-fellowship, the organization shall be more distinctly than ever useful to the members in the technical and professional sense. No one will wish the Institute any other fate. If we must have two societies such as this Institute and the Institution of Gas Engineers, whose programme is noticed above, let us hope they will mutually incite each other to good work; and this they can well do without keeping any acrimonious memories to embitter a friendly rivalry.

"Labour Day."

As we recently remarked, the season of "demonstrations" has set in with its usual severity. Next Sunday, the 3rd prox., is to be taken out of the category of Days of Rest, and called "Labour Day," because it is to be signalized by open-air meetings at different places in favour of the movement for making eight hours the legal working day. The true International, Communistic, Irreconcileable agitator of the French school, who is the real originator of this Eight-Hour Movement, calls May Day his grand anniversary—why, nobody seems to know. The British agitator, however, being distinctly saner than his French prototype, knows that it would be folly to expect the British workman to meet "in his thousands" on any day but a general holiday; so Labour Day is fixed for Sunday in Great Britain and Ireland. It may be taken for granted that if the day should happen to be fine, the demonstrations in Hyde Park and elsewhere will be very largely attended by those who care for this sort of thing. And it likewise goes without saying that a vast amount of utter nonsense will be talked at and about these celebrations. It may be noticed, for example, that Mr. Michael Davitt's paper declaims how "in every Continental capital, and "in the cities of the great Western Republic, a mighty "voice will be lifted up, which, combined with the pro-"nouncements of the labour cohorts of these islands, will "proclaim the alliance of the workers of the world on this "great labour issue." Fine words—superfine, we may say; but how does the matter stand? So far as the Continental workpeople are concerned, it appears that the Socialists, who are, of course, at the bottom of the movement, are hopelessly divided about it; and in Paris "the Marxists "and Guesdists" (whoever these may be) have refused to "play" with the others. And "the alliance of workers" is hardly more tangible here in England; for neither the Miners nor the Amalgamated Engineers, nor any other order of workmen, are agreed among themselves upon the question. Consequently, if the Labour Day meetings mean anything at all beyond proving once more that one class of town populations finds amusement in "demon-"strating," they will only imply that the pack of New Unionists and Social Democrats, whose supporters come from the roughest and most shiftless classes of the people, are prepared to support the general declaration that eight hours' work for ten hours' money would "suit their book." No doubt it would; but the rationality of this idea is sufficiently exposed by the latest "organ" of the movement, which declares for eight hours out and out, until it is time to agitate for six hours, or four. As a contemporary expresses it, these Labour politicians are really much too modest. What they evidently want is no work at all for anybody, with pay and pension from the State for all. Vastly pleasant, of course; but they unfortunately omit to say how the thing is to be managed. Yet, as they even refuse to describe how the eight-hour business is to be worked in every trade, it is useless to demand particulars as to six-hour, four-hour, or no-hour systems.

It is naturally annoying to the demagogues who pretend to speak in the name of the "allied workers of the world" when they find that such very hard-headed and positive gentlemen as the Northumberland and Durham Miners, to say nothing of the Amalgamated Engineers, and the Lancashire Textile Workers, will have nothing whatever to do with them. Your modern demagogue, however, has peculiar views as to how noses should be counted when it comes to a question of voting. He first of all rules out of the account everybody but his own particular clique; calling them "blacklegs," fossils, unsympathetic, or some other term of reproach meaning that they are no friends of his. Then he counts the remainder, and triumphantly parades the result as the mighty voice of the people! The true Kirk of Scotland was once defined by a good dame as reduced to herself and her woman Janet; and she was "no' that sure aboot Janet." So the "alliance of the "workers" now appears to consist of Michael Davitt, John Burns, and Tom Mann; but, since Mann has been put upon the Labour Commission, his dear friends (although, of course, they would not for worlds say anything against him) are evidently not altogether sure about Tom. To be recognized in such a way that it becomes necessary to speak advisedly with the lips—to be made respectable, in short—is a perilous thing for a modern Labour Representative.

The Popularization of Gas Stock.

The South Metropolitan Directors have evidently struck a rich vein by offering stock for subscription in small parcels among their consumers. As will be seen by a paragraph which appears elsewhere, a further invitation to invest in the Company's "C" stock, at the price of £242 per cent., was sent out with the Lady Day gas bills; and all that was on offer was very quickly snapped up. Indeed, disappointment at the smallness of the sum which the Directors were willing to receive was widespread; very many wishful subscribers being shut out on this account. Such applicants as were able to make their wishes known will have the first chance when another batch of stock is offered, which will not be before the September quarter; but there is now no doubt that the bulk of the gas consumers in South London would gladly become gas proprietors to a much greater extent than their opportunities are likely to permit. The advantages to both consumers and the Company from this new movement are great and obvious. It is the finest possible way of educating the ratepayer in the mysteries of the sliding scale, premium capital, and the other devices whereby the interest of the modern gas proprietor is connected with that of his customers. There

will not be much room left for the rigmarole of gas agitation when every frugal shopkeeper and retired tradesman, of the stock from which vestrymen, &c., are mostly drawn, knows for himself what modern gas administration really means. The South Metropolitan Directors seem to have opened out altogether a new line of policy with the inception and adoption of their celebrated profit-sharing scheme, of which this distribution of stock among consumers is admittedly a corollary. To paraphraze a familar saying, they appear to aim at the exhibition, so far as may be, of a gas supply "of the people, by the people, for the people" of their own particular district. And since it no longer matters to anybody who gets allotments of gas stock, if the gas consumers of the district which contribute the revenue desire it they have the best right to provide the money which carries on the business. Every advance in this direction helps to weaken the only plausible argument for the acquisition of gas property by the local authority.

The Strike of Parliamentary Counsel.

THE strike of counsel engaged at the Parliamentary Bar was happily composed before the great Railway Bill now before Mr. W. Woodall's Committee was inquired into. Practically, every bigwig of the Westminster coterie is engaged upon this measure; and nobody dares to think what might have been the consequences if the state of things created by Mr. Hanbury's ruling had persisted, and all counsel been compelled to remain in the Committee-room during the whole of the proceedings. From the lawyers' point of view, it was a happy circumstance that such a striking test case cropped up just while Parliament was unofficially pondering over the bearings of Mr. Hanbury's spirited attempt to bring counsel to a better sense of their duty to their clients. The idea that representatives of all the interests touched or threatened by a projected new railway into London from the North, must perforce assist at every bit of each other's performances in Committee, is manifestly an absurdity; and common sense goes with Mr. Woodall's announcement at the beginning of the proceedings, that he did not intend to insist upon any such strict interpretation of the rule revived by his brother Chairman. At the same time, it is possible to hold that Mr. Hanbury's strong action is likely to have an extremely salutary influence upon the practice of the Parliamentary Bar, who are no more sacrosanct a body than any other band of monopolists. The ordinary run of Members of Parliament are hardly equal to dealing with the very clever and decidedly hard-mouthed gentlemen who are paid so highly for aiding or darkening their wits, as the case may be, in respect of what had better be done with Railway, Gas, or Water Bills. Much of the treatment received by Committees and by parties before Parliament from counsel amounts to a positive scandal; but nobody ever complains, for various reasons. When a member who does not go in fear of the legal gentlemen strikes a blow at a pet privilege of the latter, it is only natural that sufferers at their hands should chuckle over the fact, without pausing to think whether or not the onslaught can on all accounts be maintained. We are anything but blind to the abuses of parliamentary practice; and the industry which we represent has suffered much in times past, as it will in all likelihood suffer again, from the vagaries of parliamentary advocates, whose ability necessarily stops short of the capacity for being in two different places, at the same instant of time, while no such incapacity is permitted to affect their receptivity for fees. All the same, we do not think that Mr. Hanbury's cure for the evils of Parliamentary Bar practice is altogether a proper and sufficient one. But perhaps, now that counsel have been taught that the eyes of Chairmen of Committees are upon them, they will discover for themselves some more satisfactory method of connecting services rendered with money received than anything which their traditional practice has yet exhibited.

Deaths from Inhaling Illuminating Gas.

THE paragraph which appeared in the JOURNAL last week respecting the deaths traceable to inhaling illuminating gases in the United States, again raises the curious question, which has never been satisfactorily answered, of why so many of the inhabitants of the States should so greatly surpass universal habitude in the matter of going to bed with the gas turned on but not lit. We learn by this statement that no fewer than 174 persons died in the States last year from inhaling lighting gas. Deducting 35 proved cases of suicide, we have still 139 fatalities from this purely local complaint. One individual is distinguished as having been killed by oil gas, and six died from the effects of breathing coal gas. Then there is a long jump to 49 deaths from water gas, and another to 83 fatalities from breathing mixed coal and water gas, which is probably the kind of lighting gas most in use in the large towns. How can this peculiar American institution of gas poisoning be explained? Suicides and murders are unpleasant, but comparatively simple, facts which are to be found in the vital statistics of all nations; but, so far as can be ascertained, the unintentional thinning out of the population by means of lighting-gas inhalation is unknown outside the States. Most of the deaths in any one locality occurred in the City of New York, where 31 persons lost their lives from this cause, and in Chicago, which had an equal number of victims. Philadelphia lost 17, and San Francisco 15; and no other place ran into double figures. From particulars of a few cases which have been specially reported upon by the Gas Commissioners of the State of Massachusetts, because they occurred within their jurisdiction, it would appear that the gas-burners in default were usually small, not always found fully open, and that the poisonous gas need not necessarily contain a high proportion of water gas. The most conspicuous victims were the wife and daughter of the President of Clark University, who were suffocated in their bed-room at home, a room 16 feet by 18 feet, containing about 3000 cubic feet capacity. It had three windows and one door, all tightly closed. A burner of a two-light chandelier was found open. The gas sent out from the local works at this time contained from 16 to 18 per cent. of water gas. An analysis of the gas made on the day of the accident showed 11·19 per cent. of carbonic oxide. A man and a woman were killed in a bed-room in a Boston Hotel; being discovered at 2 p.m. of the day after they had taken the apartment. The man was dead when the room was entered; the woman was unconscious, and died in the hospital on the following day. The gas-burner cock was found turned full on. The room measured about 650 cubic feet, and had a door and window, both closed. There was, however, an open slot 34 inches long by 2½ inches wide over the door—a sort of ventilator, in short. No mention is ever made of fireplaces in these rooms; so that one is left in doubt as to the existence of such means of ventilation. There were in all eight deaths from inhaling illuminating gas in the State of Massachusetts, all of which are summarized in the last annual report of the Board of Gas and Electric Light Commissioners, from which our information is taken.

Mr. John T. Sheard, Superintendent of the Bloom Street Gas-Works of the Salford Corporation, whose name will be familiar to our readers from the contributions he has from time to time made to our columns, has accepted the post of Manager of the tar and ammonia recovery department at the Govan Iron-works, Glasgow, in succession to the late Mr. Millen, who, it may be remembered, lost his life on the occasion of the serious explosion which occurred at the works on the 10th ult.

New Ammonia Plant.—The Coltness Iron Company, Limited, says a local correspondent of *Industries*, have just erected a new set of plant for the recovery of ammonia, capable of treating the produce of six furnaces. The quantity of gas dealt with is, at 400° Fahr., about 100 million cubic feet, or in a cold dry state 60 million cubic feet daily. The chief novelty in the plant is the introduction of a dust chamber—a dome-shaped vessel 40 feet in diameter by 65 feet high. This dust chamber, devised by Mr. W. Young, of Peebles, enables the dust to be separated from the gas, so that the latter may pass to the subsequent processes free from dust particles. The contractors for the plant were the Barrowfield Iron Company, Limited; the buildings being erected by the Coltness Iron Company themselves.

The Thomas "Globe" Lamp.—This new lamp, the invention of Mr. T. C. J. Thomas, of the Thomas Lighting Company, of Carthusian Street, E.C., has been specially constructed to give a brilliant downward ceiling light, which is so necessary in public buildings. It is peculiarly adapted for suspension, instead of being supported from below. The base, carrying the burner and other parts, is connected to the centre socket of the regenerator by means of a pipe, which is fixed to the base, and which at its upper end is carried into the socket. It is closed at the lower end, and is formed with 24 lateral holes, through which the gas passes. These holes are surrounded by the burner, in the form of a truncated conical tube. The flame plays on the cone, producing a brilliant light. The "Globe" lamp has already been adopted in several large institutions.

WATER AND SANITARY AFFAIRS.

Although still chemically critical, Dr. Frankland bears witness in his annual report, just issued by the Registrar-General, to the great improvement which has taken place in the Metropolitan Water Supply from time to time. The Thames water distributed during the years 1889 and 1890, is declared to have been "superior to that of "any former year as regards comparative freedom from "organic impurity." Of the Lea water in 1890 it is said that the supply "contained markedly less "organic matter than at any time during the previous "twenty-two years." The deep-well water, of course, contains less indications of organic matter than the supply which comes from the rivers. But the proportion varies considerably as time goes on; and last year's figure is not the best. Preference is expressed for the deep-well water, although it is admitted that the sand filtration effected by the Companies who take their supply from the rivers is "highly valuable." It is also acknowledged that the actual amount of organic matter in the river supply is "generally "quite insignificant." The objection urged is that this material may at some time or other be accompanied by zymotic poisons dangerous to health. Nevertheless, we are informed that the chances of these objectionable substances reaching the water consumer are "greatly "reduced," both by the filtration to which the water is subjected by the Companies, and by the care which is exercised in excluding the flood waters from their reservoirs. All that is wanting is the "absolute guarantee." We fear it will be difficult to get this, unless deep wells will furnish all that London wants—a condition of things not likely to come to pass. In the absence of entire perfection, Dr. Frankland is gratified by the fact that most of the Water Companies are endeavouring to substitute, as far as possible, water from subterranean sources in place of that derived from the rivers. The Conservators have also rendered important aid, by having "almost completely "stopped the discharge of untreated town sewage into the "Thames." Respecting filtration, Dr. Frankland publishes a table which, as he says, "strikingly shows the "enormous improvement" which the Water Companies have effected in the process since 1868. In that year 48 samples out of 84 were more or less turbid; whereas during 1890, all the 84—being one per month for each of the River Companies—was "perfectly clear and transparent."

The Annual Summary of the Registrar-General respecting London, serves to prove that, while the general healthfulness of the Metropolis is a testimony to the goodness of the water, there are other causes at work which occasionally neutralize that advantage. Had it happened last year that the water supply showed marked signs of deterioration, this would probably have been held to account for the extraordinary mortality of London in 1890. The deaths in the Metropolis during the past year were 15,560 in excess of the mortality in 1889—raising the death-rate from 17·4 to 20·3 per 1000 Yet the quality of the water supply in the two years was practically the same, and in both instances decidedly good. With the water supply thus on a level as to its quality, and showing no sign of being otherwise than perfectly wholesome, the supply is obviously disassociated from the extraordinary mortality of last year. According to the character of the water, the Metropolitan death-rate ought to have been as low in 1890 as in 1889. The circumstance that it was very far from being so, shows that London is capable of suffering seriously from causes quite outside the question of drinking water, although the healthy condition of the Metropolis for a series of years agrees with the inference that the water supply is good and wholesome. There is the more reason to dwell on this point, as we find Dr. F. H. Blaxall, one of the Medical Inspectors of the Local Government Board, in a report to that Board upon the sanitary condition and administration of the Rural Sanitary District of Staines, draws a somewhat disquieting picture of the effect likely to be produced on a portion of the London Water Supply by the cesspools which exist in the gravel beds underlying that rural district. Of course, it is high time that this state of things was corrected. If the place is not worth draining, it is a pity it should be inhabited. As the locality is said to suffer from typhoid fever, could it be dealt with as an "unhealthy area?" A benevolent despotism would buy the land and evict the tenants—with compensation, of course. As for the present effect on London, we do not observe any increase in typhoid fever as taking place in the Metropolis last year. The deaths from enteric fever were considerably below the average, as also those from diarrhœal diseases. The people of the Rural District of Staines appear to be using up all the typhoid germs for themselves.

The Birmingham City Council last week approved the scheme recommended by their Water Committee for obtaining a supply from the sources of the Elan and the Claerwen in Mid-Wales. The decision has been practically unanimous, though the plan has been to a certain extent criticized. When first adverting to the scheme, we remarked on its costly character, and a letter now appears in the *Birmingham Daily Post* from Mr. Edward Chesshire, F.R.C.S., in which the Council are reminded that the £4,000,000 proposed for the Welsh supply would represent £10 a head on the entire population, and that if the same principle of expenditure were adopted in purchasing the undertakings of the London Water Companies, the outlay would amount to upwards of £60,000,000. Our own suggestion was that the cost of a new supply for the Metropolis, drawn from a yet greater distance than that proposed in the case of Birmingham, would involve a much larger outlay than anything yet contemplated, if the expense were in proportion to that of the Birmingham scheme. It does not appear that the Birmingham estimate errs by excess. The only thing is that those who object to the scheme, appear to rate the cost per head at rather too high a figure. The population of Birmingham is estimated by the Registrar-General at 469,000; but to this we should add something for the populations to be served on the line of the aqueduct. At the same time, reduce the cost per head as we may, the expense of taking a supply 80 miles to Birmingham is on a much higher scale than what we are told would be that of supplying London from the upper portions of the Severn or the Wye. Birmingham is induced to adopt the scheme propounded by Mr. Mansergh and Mr. Gray through fear that the present sources will in the course of a few years fail to meet the increased demand. Such is the argument now used in respect to the Metropolis by those who are opposed to the Water Companies. This is a matter on which it is very possible to make a mistake; and it is not yet proved that London is under the necessity of seeking water far off, however true it may be in the case of Birmingham. Deep wells are said to fail; but London is not solely dependent on deep wells. There is an abundant flow of water in the Thames Valley; and it is quite possible so to husband this as immensely to increase the present supply without incurring any extravagant outlay. Birmingham can do something of the same kind, by utilizing the flood waters of the Bourne; but it is said that this resource will only last good for twenty years. Birmingham has set its heart on two Welsh rivers, and is afraid lest the London County Council should step in before it. If Parliament ratifies the present scheme, Birmingham will simply have to pay the price, and London need be none the worse.

Board of Trade Returns as to Gas Undertakings, 1890-91.—Last week the usual returns relating to all authorized gas undertakings in the United Kingdom—in the case of the companies for the year ending Dec. 31, 1890, and in that of the local authorities, for the year ending on the 25th ult.—were ordered by the House of Commons.

Producer Gas made with Oxygen.—Referring to the "Note" on this subject which appeared in the Journal last week (p. 741), Mr. F. J. Jones, of Bedford, informs us that the use of oxygen instead of atmospheric air for making producer gas is included in one of his patents, now nearly three years old; and that when oxygen is a little lower in cost than it is at the present time, the process will be brought forward, as producer gas made with oxygen would now, he says, cost 8d. per 1000 cubic feet for about 16-candle power.

The Metropolitan Water Inquiry.—The Hybrid Committee of the House of Commons to whom have been referred the various Bills dealing with the water supply of the Metropolis which have been promoted this session, will meet to-day under the presidency of Sir Matthew White Ridley. Some notion of the extent of the inquiry upon which the Committee enter may be formed from the fact that no fewer than 46 petitions have been presented against the London Water Commission Bill—the one to be first considered. Practically every governing body in the Metropolis, and the principal local authorities in the home counties, are opposed to the measure.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 806.)

BUSINESS in the Stock Markets during last week has not been above the average, and the intervention of two Jewish Holidays in the middle of it reduced the otherwise normal attendance. Nothing occurred to alter materially the general position of affairs which marked the close of the preceding week. The stronger markets maintained their lead; and the weaker ones (except for a slight recovery in Argentines) remained as they were. The belief, to which we referred in our last issue, that a material revival of business activity is setting in, still obtains in some quarters; but it is certainly not coming with a rush. Great caution should be exercised before committing oneself to much, especially in the American markets, both north and south. Money continues to harden; and the Market is understocked. A rise of another ½ per cent. in the bank rate on Thursday would do no harm. Transactions in the Gas department have been more extensive than the week before; and issues of all sorts—both ordinary and secured—and of all classes of undertakings (home and foreign) continue in good demand. Gaslights have been most brisk. The "A" is very steady; and it is a remarkable circumstance that every day it was dealt in it realized the same figure, 243½. The preference issues were well supported; and the quotations of all of them have risen from 1 to 2 per cent. South Metropolitans have been quiet; and nothing was dealt in but the "B." The quotations have been rather shuffled about. The "C" was put up 1; and "B" was put down 2. The debenture stock was put up 1½, and then taken down 1. As no business was done in either "C" or debenture, the cause of these movements is unknown. Commercials have made further advances. Dealings in Brentford, British, and Alliance and Dublin have kept the Suburban and Provincial list in evidence. The first-named has improved, and the second is very steady; but the last did not fetch any good figures. Of the Continental undertakings, Imperial Continental is firm and active. Continental Union and European were busy, especially the latter, and both have gone up in value. Oriental has advanced ¼; and Bombay looks like rising. The report and accounts just issued indicate good business; but loss in exchange is equal to 3 per cent. on the capital for the half year. South Americans have not moved. Water has been very flat. Some stocks were too freely offered; and prices were knocked down accordingly.

The daily operations were: Moderate business in Gas on Monday. South Metropolitan "C" rose 1; and ditto, debenture, 1½. In Water, Kent and West Middlesex fell 5; New River, 2½; and Grand Junction, 1. On Tuesday, transactions in Gas were about the same. Many stocks improved. Gaslight preference rose from 1 to 2; Brentford, 1 to 2; and European, ½. South Metropolitan debenture was put back 1. Lambeth Water fell 2. There was great activity in Gas on Wednesday, and prices generally were good; but South Metropolitan "B" receded 2. Lambeth Water fell 1 more. Gas continued fairly active on Thursday, and was very firm. Commercial old rose 3; ditto, new, 1; and Continental Union, ½. Water went all to pieces. Chelsea, Kent, and New River fell 5; Lambeth, 1 to 2; and East London, 1. Gas was rather quieter on Friday, at steady figures. Saturday's business was extremely restricted; and all quotations closed without further change.

ELECTRIC LIGHTING MEMORANDA.

The Electric Light in Birmingham—A Mistaken Policy—The True Cost of Domestic Electric Lighting—The Illuminating Power of Arc Lamps.

THE formal inauguration of the undertaking of the Birmingham Electric Supply Company by the Mayor of the City, on Wednesday last, is an incident that deserves at least a passing comment. The important stake which the Birmingham Corporation hold in the local gas undertaking has not prevented them from showing every consideration that could be reasonably expected to the electric lighting interest. In fact, the Corporation gave the Electric Lighting Company their first considerable order, for the lighting of the new Law Courts. The Company have started with a charge of 8d. per unit, which corresponds to 8s. 8d. per 1000 cubic feet of gas, at which the Gas Department do not, in all probability, feel in any serious alarm. At the same time, as the Mayor publicly hinted to the Chairman of the Gas Committee, the presence of the new light in the best parts of the city will tend to put the Gas Committee on their mettle, by exhibiting ocular demonstration of the truth that a low price is not everything in a means of lighting. There can be no doubt that the great temptation of local authorities controlling gas undertakings lies in the desire to make these concerns pay the largest possible subsidy towards the relief of the rates; and the advantages, say, of sulphur purification are apt to be ignored because purity means expenditure on revenue account. Seeing that electricians make such a strong point of the purity of their light, it is just as well that this consideration should be kept under the noses of a corporation gas committee.

Birmingham is not Fareham, and having noticed the fashion in which the owners of the great Midland gas undertaking treat the purveyors of electric lighting, it is instructive to note the way in which, according to the "Legal Intelligence" published in last week's JOURNAL, the large-minded representatives of the Fareham gas interest bear themselves towards electricians. The Fareham Local Board being apparently strong partizans of electric lighting, to the extent of patronizing a little local speculation of the kind, the Gas Company have instigated two counter-moves against those whom they chose to regard as enemies—one being an indictment for nuisance, and the other a frontager's action, both designed to stop the electric lighting, by compulsory removal of the wires and posts. Both attempts failed; and the Fareham Gas Directors must consequently feel very small and sore. If they were unpopular before, they must be worse off now; having ensured to their foes the popular sympathy that is certain to follow success in fighting a vexatious lawsuit. Once and for all, let us say it, we have no sympathy whatever with such ideas as those which seem to possess the Directors of the Fareham Gas Company in regard to the proper way to defend the gas interest. These gentlemen should take a leaf out of the Birmingham Corporation book, if they wish to learn how to treat electric lighting. Can they have imagined for an instant that the ultimate result of the competition, such as it is, between gas and electric light could be affected in the slightest degree by their giving the electricians unnecessary trouble about their posts and wires? Why, in the name of all that is sensible, could not the Fareham Gas Directors do as their like in such comparatively insignificant places as London or Liverpool do—stick to their own business, and let the electricians and everybody else do their little utmost?

The ingenious Editor of *Truth* has been exercised in his omniscient mind on the subject of charges for electric lighting; and with his usual candour he has taken his readers into his confidence. Like many other dwellers in aristocratic London, he has adopted incandescent lamps for some of his rooms; but—also like many others—he has a difficulty in reconciling the amount of the service rendered with the bill sent in. He has got hold of the datum that a unit of electricity will keep a 16-candle lamp going for 16 hours, or an 8-candle lamp for 30 hours. So far, good. He then proceeds to estimate his electric lighting service during the Christmas quarter (as he thinks very liberally) at seven hours' daily use of 22 lamps (eighteen 8-candle and four 16-candle) for 87 days. Working this out at 8d. per unit, he finds that the charges ought to be a few pence under £18. Instead of this, it was £37; thus showing that the "meter had been good enough to register more than twice the amount of the electricity consumed." The cost of gas would have been about £6 10s. in the same locality. A little fact of this character is worth much more than all the rubbish talked by advertising electricians as to the cheapness of even high-priced electricity in practice.

The fanciful rating of arc lamps at very much more than their actual illuminating power, has got the electricians concerned with the lighting of the streets of Bath into some discredit. The Bath installation was put up by the Laing, Wharton, and Down Syndicate. It is consequently upon the Thomson-Houston system, in which the arc lamps are conventionally specified as of 1200-candle power. It having become notorious in the city that the lamps did not give anything like this illuminating effect in use, the Corporation were driven to consult an electrical expert to report as to what the lamps really are doing. Professor Forbes was the favoured gentleman; and he has not only reported to the Corporation Committee, but has actually been cross-examined upon the text of his report, which is a remarkable circumstance. Professor Forbes was bound to admit that the lamps complained of were what are called in the trade 1200-candle power Thomson-Houston lamps; but he also had to confess that, in practice, each of these lamps does not give out more than 300 or 400 candle power of light. His difficulty then lay in having to persuade the Corporation that the lamps were according to the terms of the contract, which specifies for 1200-candle power, while as a matter of fact they do not give much more than one-quarter of this amount of light. The Bath people are inclined to be obstinate on the point that, having agreed to pay for 1200-candle power lamps, they ought to get what they pay for. But on the other hand, the electricians contend that so they do; inasmuch as the lamps bear this nominal rating "in the trade." It is contended that there is no guarantee that because a particular sized piece of electrical apparatus is called a 1200-candle power lamp, it shall therefore always give 1200-candle power of light. The lamp is one thing; the light is another. Messrs. Laing & Co., being appealed to, state that a lamp of this class, when burning at full power, gives for an angular measurement of from 40° to 60° below the horizontal, without a globe, even more than 1200-candle power. Professor Forbes thinks that this statement may be correct under the best possible circumstances. That such lamps are never meant to be used without a globe does not affect the electricians' position. What they say to their customers after they have secured a contract is, in effect, "this is what we meant when we undertook to supply 1200-candle power lamps; what you expected is no concern of ours."

The Manufacture of Oxygen Gas.—It is reported that a new process of making oxygen gas has been devised by an American chemist. It is based on the decomposition of plumbate of lime, which, when heated with an alkaline carbonate, is decomposed into carbonate of lime and peroxide of lead. At a still higher temperature the latter substance is again decomposed into protoxide of lead and oxygen gas; the latter being evolved in a free state.

RULE-OF-THUMB.

THERE is hardly a subject within the whole range of engineering respecting which more misapprehension exists than hovers over the familiar term that serves for the heading of this article. It is generally believed by users of the phrase in a contemptuous way—and it is seldom employed otherwise—that a process or device is sufficiently condemned when this description can be applied to it. The very sound is enough; even when the words are seen in print, one can realize the sniff of scorn which would attend their *vivâ voce* expression in certain company. Whoever hit upon the term must have been for the moment inspired; for it is not often given to men to be able to formulate such a happy, significant, and conclusive appellation for an order of practices clearly recognizable as distinct of their kind, yet not susceptible of precise definition. To call anything "rule-of-thumb"—that is, to say that no intelligible reason can be given for the practice—is, as we have remarked, tantamount in the minds of some people to condemnation of the thing itself; but this is an error. We may know that a rule is correct, inasmuch as it answers our requirements, while we may not be able to say why or wherefore. In these cases rule-of-thumb is justified by its results. Let us consider this aspect of the question; and if reflection leads to something very like excuse of certain kinds of rule-of-thumb, let us not be ashamed to acknowledge the good points of our old friend.

Consideration of a variety of topics that have been mentioned in the JOURNAL of late (to say nothing, for the time being, of other evidence) lends a great deal of support to the suspicion that the term rule-of-thumb is very often only a vulgar and depreciatory designation for what is equally capable of being described as the experimental method of carrying on engineering, chemical, and other operations. Fair Juliet's sophistical question notwithstanding, there is a very great deal indeed in names. If most of us were to visit a manufactory the manager of which assured us was carried on "strictly after the experimental method, without regard to preconceived hypotheses," we should in all probability agree that this is the proper way to go to work. If, being a plain-spoken man, he should admit that "all was done by rule-of-thumb," the chances are that his hearers would consider such an admission derogatory. Needless to say, both statements might mean exactly the same thing.

When rule-of-thumb is demonstrably only a familiar term, equivalent to and convertible into any other form of describing what is known as the experimental way of going to work, so far from being a term of reproach, it is an honorific description, for very few manufacturing processes have any other origin; and unless the results of engineering or physical operations in general are capable of being tested by what are loosely called rule-of-thumb methods, these are hardly to be considered as possessing a practical, commercial character. We can see this in connection with the electric lighting industry, for example. In the degree in which electric light plant remained what is improperly called "scientific," when something merely finicking or needing delicate manipulation is meant—so far did it remain a curiosity of the laboratory. The professors would never have made anything of it if it had remained in their hands. It was only when Gramme, the carpenter, put together dynamos by rule-of-thumb, that they began to be useful instruments. Mathematical investigations never helped a man to build an economical steam-engine or a machine capable of doing hard practical work. When a locomotive engineer wants a new express engine to beat the expresses on a rival line, he does not sit down and evolve a perfect engine out of his inner consciousness, aided by a senior wrangler's mathematical equipment. He looks up the detail drawings of the best engines on his own and other lines, and makes such improvements as his judgment suggests, having regard to the work required to be done and the conditions of the performance.

In describing last week the manufacture of oil gas in Pintsch retorts, it was stated that the quality of the work done is gauged by simple inspection of the colour of the crude gas—rule-of-thumb, of course, but sufficient for the end desired. All the water gas that is made in the world is manufactured under very much the same kind of test. Coal-gas making was notoriously, in the early days, a rule-of-thumb business from beginning to end; and wherever progress has been sought in this manufacture, by working from the rough-and-ready to the precise, it has usually been fruitful, while the contrary course of starting from a supposed "scientific" hypothesis, and working towards a practical issue, has scarcely ever come to any good. The question is really one of the proper use of language. What has come to be accepted as the rough-and-ready, practical standard of working, may, in truth, be the only scientific—that is, exact and sufficient—way of testing it. The chances are that there is infinitely more true science in the rough-and-ready methods by which admittedly good work is done, than there is in the pretentious investigations by which these methods are occasionally judged.

If quick, reliable, simple rules of working that can be understood and applied by working men are all to be called rule-of-thumb, then the more we have of this the better; for until an industry has been reduced to this kind of rule, it is not safely established upon a commercial footing. We may imagine a case of a way to make coal gas free from sulphur, such as a correspondent of the JOURNAL last week apparently desires exceedingly. What chance would any such process have of acceptance if its operation needed to be watched over with a spectroscope by a gentleman with a diploma of science? In all such matters it is the simple which is scientific, and the complicated which is not worthy of the name. It is tolerably safe to say that, long before this, people who were induced to put their money into electric lighting ventures, on the recommendation of the "scientific" character of the light, have seen reason for wishing that it was something else, if to be "scientific" means being costly and unreliable, and not particularly wanted by the people generally.

The fact is that it takes a clever person to distinguish the science in a common, homely matter. Most people are far readier to reverence what is abstruse and apparently difficult, than they are to perceive the proof of masterliness in simplicity. Engineering in particular has suffered from the presumption of professors, who have too often essayed to make pedantry take the place of common sense. The point of Swift's satire upon the Laputan tailors who took their customers' altitudes with the sextant and computed their dimensions according to recondite rules, instead of measuring them with a tape, remains good for to-day. How often do we find in text-books most elaborate formulæ for calculating certain problems, which, while working out to four or five decimal places, are vitiated from the outset by the inclusion of some utterly vague and empirical coefficients? When a man has to do with a Forth Bridge, he needs all the help that mathematics and geodesy can supply; but whoever parades his acquaintance with the calculus in connection with a problem which a competent man could dispose of with the aid of a two-foot rule, makes a public confession of mental weakness.

It comes to this, that the ablest men have the widest command of rule-of-thumb; and the best worked-out arts are those most amenable to this rule. It must be the ambition of learners in every trade to master first of all its traditional rules and methods. Even if he comes straight from a technical college into the most technical of trades, such as manufacturing chemistry, the youngster who has only learned from professors and from books will find that he has a great deal to pick up from the rough-and-ready fellows who actually make things to sell. Within the past few years there has been quite a small rebellion in the chemical world, on the part of the industrial branch, as against the domination of the professorial element. Some chemical manufacturers, greatly daring, have actually gone so far as to say that many academic chemists know very little of their profession, and would be all the better for a year's turn in the yards, where chemistry goes by the ton instead of by the test-tube. This protest means nothing more than that rule-of-thumb, when it signifies the practically efficient rules that workmen have to trust to for getting results, is not to be despised, particularly by those who are the more disposed to sneer from the fact of knowing nothing about it.

Wherefore, when gas engineers hear the so-called rule-of-thumb of gas manufacture and gas lighting reviled by such as talk at large about the scientific character of electric lighting, they may take courage from the reflection that the electricians must wish in their hearts that they had a little more of what they affect to despise. There could not have been much true science, for instance, about those Grosvenor switches, for an attendant to be able to burn the whole place down as the result of a momentary error of judgment. And the science that connected electricity with the preposterous delusion of tower lighting was about as plain a result of deductive blundering as this age has witnessed. Far be it from any thoughtful critic to defend that sort of rule-of-thumb which sets itself up against light obtained from intelligent research, and debases the good and practical until it means, in effect, something imperfect or incomplete, as handiwork derived from brains. We do contend, however, that the simplest rules of working, wherever obtainable, are the best; and that to reject them, unless they are obviously misleading, in favour of the complex, the hypothetical, or the merely high-sounding, would be a piece of weakness and pedantry that should be scorned by sensible men.

Further Issue of South Metropolitan "C" Stock.—Owing to the disappointment felt by a number of the customers of the South Metropolitan Gas Company in not securing an allotment of the "C" stock which was offered to them in small parcels last September, the Directors a few weeks ago decided to make a further issue. Notice to this effect was accordingly sent out with the March accounts, with the result that all the stock for disposal—about £20,000 worth—has been readily taken up. As on the previous occasion, many who were desirous of becoming investors in, as well as customers of, the Company were doomed to disappointment; but we understand that it is the Directors' intention to give them another opportunity next September, when their claims will be first considered. The stock was issued at the price of £242 per cent.; and it carried dividend from the 1st of the month in which it was sold. Stock acquired in this way, besides yielding a good return to the investor, is obtainable without entailing upon the purchaser any charges or expenses.

NOTES.

The Effect of Metals as Light-Radiators.

The effect of the heating of metals or metallic oxides in gas-flames or other sources of light, upon the luminous effect produced by such sources, is a subject that has long occupied the attention of inventors. The most familiar example of such a device is the fish-tail burner with a piece of platinum across the crown, which is believed to be still on sale in some places. Attempts are being made to utilize the light-radiating power of highly-heated metals; among the latest being the arrangement patented by Mr. James Clegg, of Westminster, who seeks to improve the illuminating effect of the incandescent electric lamp by a method of treating the filament which vividly recalls memories of the platinum-fitted gas-burner. Mr. Clegg proposes to dissolve the salts of certain metals in some volatile fluid, and to coat incandescent lamp filaments with these metallic preparations by a "flashing" process, the effect of which may or may not be to chemically incorporate the metal with the carbon of the filament. Whatever the chemical result, however, Mr. Clegg asserts that the actual effect of his process is to increase the durability of the filaments so treated, as well as to improve its quality as an illuminant. For example, a carbon filament which before treatment consumed 4·25 watts of electrical energy per candle power of light emitted, after treatment with magnesium iodide consumed only 2·2 watts per candle. Another result of the treatment is stated to be that the treated filaments undergo very little change of resistance when subjected to extreme variations of temperature. It is admitted by Mr. Clegg that the idea of metallizing incandescent lamp filaments is not new; but he claims a particular method of obtaining this result. The general interest of the proposal consists in its recognition of the efficiency of heated metallic substances as light-radiators, which has led to many, hitherto vain, efforts to use them for this purpose.

The Care of Wire Ropes.

Now that wire ropes are coming into use in gas-works, both for gasholder guiding and the transmission of power, hints for their preservative treatment are to be welcomed. According to a German recipe, wire ropes should be painted, to saturation, with a mixture of graphite boiled in tallow, which is to be repeated at intervals, presumably until the interstices of the rope will hold no more. This treatment is a protection against rust, and prevents abrasion. The graphite grease also prevents the rubbing of the several strands of the rope against each other, which must happen when the rope passes round pulleys, as it finds its way into the most minute interstices. Or raw linseed oil may be mixed with Stockholm tar, and the rope paid thoroughly with the mixture. For ropes intended to work below water, or in damp underground channels, a composition of 35 measures of slaked lime and from 50 to 60 measures of coal or Stockholm tar is recommended, to be well boiled and applied hot. Galvanized wire ropes should never be used for driving purposes, because after a very short period of service the coating wears off, and the rope soon begins to rust. Great care should be bestowed upon the pulleys or sheaf blocks. The grooves should be kept clean from everything like grit; and if lined with anything to increase adhesion, this must be of the best quality, and be regularly seen to. Steel ropes are made to bear a tensile strain up to 50 tons per square inch if desired.

The New Gaseous Theory of Solution.

A great deal of sound, although unpretentious, work has been done of late in the interesting border-land between physics and chemistry, with regard to the investigation of the laws of solution. Under the leadership of Mr. Van't Hoff, considerable progress has been made towards the establishment of a gaseous theory of solution; but the task of popularizing the results of this work remains to be performed by somebody who combines sufficient knowledge of the matter with the gift of expression. Something has been done in this direction by Professor Orme Masson, who devoted part of an address recently delivered before the Australasian Association for the Advancement of Science to this as yet somewhat abstruse subject. He likened a soluble solid in contact with water to a volatile body in presence of space, and described the process of solution as analogous to that of vaporization. As the concentration increases, the osmotic pressure of the dissolved portion increases, and tends to become equal to the pressure of the undissolved portion; just as, during vaporization in a closed space, the pressure of the accumulating vapour tends to become equal to the vapour pressure of the liquid. But if there is enough water present, the whole of the solid will go into solution, just as the whole of a volatile body will volatilize if the available space is sufficient. The question of saturation or non-saturation is also alike for a solid in a solvent, and for a volatile fluid in space.

Water-Tube Boilers.

It is reported that the fashion of water-tube sectional boilers, which arose almost simultaneously with the establishment of central station electric lighting plants in this country, is already dying out, since it has been found that they are not economical under the best conditions; and when full steam is only required for a short time during the day, as is the case with electric lighting plant, they are not so convenient as ordinary enclosed furnace boilers, besides being much more wasteful. A test of a boiler of this type, made by De Naeyer and Co., of Belgium, under the auspices of Mr. Bryan Donkin, jun., and Professor Kennedy, and included in their systematic boiler tests with identical fuel, &c., showed for it an evaporative duty of 12 lbs. of water from and at 212° Fahr. per pound of coal pure and dry; the absorption duty of the boiler itself being 62·5 per cent., and of boiler and economizer together 74·4 per cent. of the available heat of the pure and dry coal. It appears, however, that this type of boiler is not suitable for keeping ready, with a small fire, to be pushed into full steaming power at short notice. On the other hand, they do not occupy much room from front to back, as compared with Lancashire or Cornish boilers, and they are therefore more suitable for town use where space is limited in depth. Compared with the locomotive type of boiler, which is the favourite form of Messrs. Davey, Paxman, and Co., the water-tube sectional boiler is cumbrous, and the mass of brickwork which it requires dissipates much heat by radiation and through cracks.

COMMUNICATED ARTICLE.

THE STANDARD OF LIGHT.

By Walter Grafton, of The Gaslight and Coke Company, Beckton.

(*Continued from p.* 691.)

With a view to remedying the error in photometry alluded to in the previous article, the writer has made a great number of careful experiments, using the candle in almost every conceivable way and in different photometers—amongst which may be mentioned the closed Evans, 100-inch bar, the improved Evans, 60-inch bar (candles fixed); the Imperial, 60-inch bar; the Letheby 60-inch bar (Tooley Street pattern); and the Letheby 60-inch bar (Lambeth Road pattern). The results of the more characteristic of these experiments will be given in a subsequent article; and the conclusions arrived at are that the many discrepant results obtained from different photometers are chiefly due to the candles, and not to the photometers, which influence the testings but little. The closed Evans photometer gave better results than the others; the reason being because the increased temperature aided the candles in arriving at their normal condition sooner than they do in any other form of instrument. Also, the aqueous vapour in the air helped to lessen the candle's light.

It has often been noticed, when looking over the results of photometric testings on gas, using the candle as a standard, that there is a wide difference between many of them; and this is not at all an uncommon observation even when the tests have been made on the same gas with the same candles. Now, if the standard candle were, as its name implies, a true fixed quantity, these discrepancies could not exist. The writer, therefore, has investigated the matter with an endeavour to account for all this discrepancy. Carefully executed experiments have shown him that the erratic results obtained by candles are not due to the consumption of sperm or to any particular photometer, or (to some extent) to temperature, or to the number of threads in the strands, or to the plaiting of the wicks, but to the curvature assumed by the wicks. Moisture in the wicks affects the light very much; and this can only be prevented by care on the part of the manufacturer.

It is advanced by some that, by using a candle which has been lighted, extinguished, and re-lighted a number of times, a greater development of light is obtained. This may be so; but the greater development of light is not due to the repeated lighting of the candle. It is due to another cause; and experiment has proved that if the same candle were allowed to burn longer than the minimum authorized time of 10 or even 15 minutes, this high development of light could not be obtained. Many (in fact, most) low returns are entirely due to the candles being allowed to burn an insufficient length of time; and the writer confidently asserts that the 10 minutes now allowed for the candles to reach their normal rate of burning is quite inadequate and ought to be extended to at least 20 minutes, since their normal rate of burning (by this is meant the consumption of 120 grains of sperm per hour) is not their normal light per grain of sperm consumed. The same applies to newly-prepared candles. The contention is that these emit less light, and consequently a better return is given to the gas; but in almost every case such return is the correct one. For this reason, newly-prepared candles have their wicks uncharred to commence with; and in such a case it is very noticeable that no material bending of the wicks takes place. They bend only a little from the upright; and if they be kept in a place free from extraneous draughts, the curvature of the wick will not increase, but remain the same to the end.

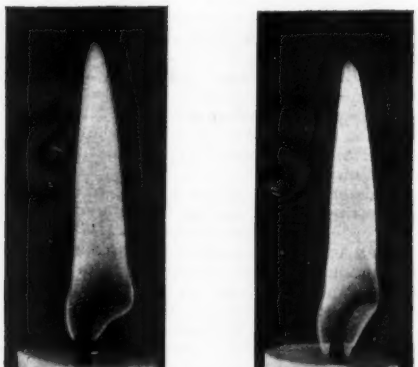
Experiment seems to show that moisture does not affect candles to any appreciable extent. If kept in a dry place, candles do not contain moisture; but if they are kept in a damp place, they will absorb about one grain each. This is really so small a quantity that it would be difficult to say it had any effect on the light emitted by a candle. Candles, however, yield more light in winter, when the temperature is low, than they do in summer, when it is high. This being the case, it is absolutely necessary to keep the photometer-room at a uniform

temperature, summer and winter. The best temperature to work under is 64° Fahr., as then, summer or winter, the aqueous vapour in the air is the same. Of course, in very hot weather the temperature would have to be kept down by means of a refrigerator, or else a necessary calculation made to compensate for the increased moisture in the air. The whole of the experiments have been carried out under an average temperature of about 65° Fahr.

In tabulating the experiments, the writer has given distinctive names to the different wick curvatures, in order to show more clearly the difference between the results.* The photometer used is also indicated at the top of the tabular statement of the results obtained with the instrument named; and each instrument was supplied with a different quality of gas. The names given to the curvatures are "natural (or normal) bend," "quarter bend," "half bend," and "upright;" and they are represented respectively by diagrams A, B, C, and D. These have been photographed as nearly as possible full size. The illustrations showing flames are from photographs of candles which were taken with great care; and the exposure to specially-prepared plates allowed in each case was from 6 to 8 seconds. They are good, considering the many very slight draughts which affect the steadiness of flames. They are also full size, or as nearly so as was practicable under the circumstances in which they were taken. The following is the explanation of the reason for one acting differently from the other, and their influence in testing gas or any artificial light. The order followed in making the experiments was to commence with "quarter bend," "natural bend," "half bend," and "upright;" but each has been reversed in the four orders, with identical results.

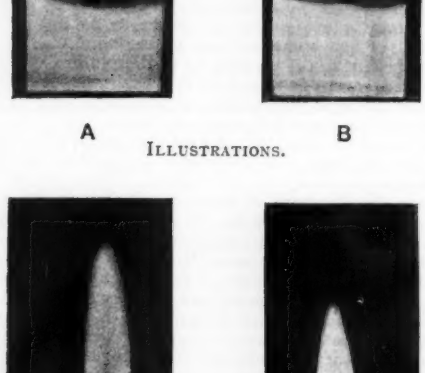
A B C D

DIAGRAMS.



A B

ILLUSTRATIONS.



C D

ILLUSTRATIONS.

Illustration A.—Candles having their wicks in this position or bend from the upright behave as a standard. They yield a more uniform quantity of light per grain of sperm consumed than they would do if their wicks assumed any other position. As the combustion of the wicks is going on, there is a steady bending of them, which, with their clear-glowing ends, governs the capillary attraction; thus ensuring an almost unvaried consumption of sperm. When supplied with a constant quantity of oxygen, this yields a flame of fixed dimensions; giving a steady and reliable light. To obtain this formation of wick, the candles must not burn less than 20 minutes before making a test; they seldom require longer. One great advantage in using candles having their wicks in this position is that they never burn outside the limits; for of the large number of tests the writer has carried out, not one has had to be rejected on this account. This is a great deal to say; yet it is not the only thing in their favour. One great point is that test after test can be made with different candles, with the result that there will not be more than half a candle difference between any two of them; in fact, the difference is generally from 0·0 to 0·3. Candles, then, which are used having their wicks as Diagram A, and giving such results, are undoubtedly worthy of the name of "standard," as they yield a reliable and constant light of 2 candles' power. This being so, any substitute can now be compared with such a standard; the consequence being the standardizing of a still more reliable unit of light.

Illustration B.—Candles are more generally used having wicks curved as shown in this illustration; and if they have not, they are in many cases made to have it, independently of infringement of instructions, and quite innocent of doing an injustice to the gas to the extent of one candle. The reason for this form of wick doing an injustice to the gas is because the flame which burns from it is wider, and more exposed to external influences; thus rendering a greater development of light than is yielded from a candle in its normal unmolested state. The consumption of sperm has materially nothing to do with the high power of the flame; for, in the experiments made, the amount consumed is practically the same as in the case of A. Now, since the consumption of sperm has not materially altered, the light emitted must be augmented by some other cause. The flames being wider, are not necessarily thinner; but the oxygen combines, or has a greater opportunity of doing so, with every carbon particle of the flame—producing more incandescence than is the case in flames A and D. The flames are the same length as that of A, and have the same composition of fuel to consume; but, on account of the wicks being more bent, they form a larger generator wherein the fluid sperm is converted into a gas, and the incalescent power of the generator is greater at no more expense of fuel, since the capillary attraction does not increase. This gas, then, immediately on leaving the generator, enters the coalescent chamber, or blue part of the flame, where its carbon particles and the oxygen of the air unite to such an extent that they emit light before they reach the zone of incandescence; the result being a greater development of light per grain of sperm consumed. Therefore, by using such a standard, a lower result by one candle is given to any opposing light. The wicks in this position have a lifetime of fully 20 minutes, when they assume the curvature shown in A. Had they maintained their formation downwards, and the light emitted remained more uniform, it would have been a matter of opinion which was the right and fair way to use them. But candles behaving in this manner cannot be countenanced as a standard. It is specially worthy of notice that the small piece of flame below the bend of the wick is the governor of the entire flame. To show in a most effective way that this is the case, take a candle which has been burning for some time, and make its wick loose, but retain the "quarter-bend," or any bend desired. This will augment the consumption of sperm to such a high degree that the flame will be incapable of dealing with so large a quantity of fuel, and will be compelled to give it off as smoke. Now take a pencil or some pointed article, and just touch this bit of flame. The result is that the upflow of sperm is at once checked; and consequently the flame burns without smoking. Take away the pencil, and it again smokes.

Illustration C.—The experiments made with the form of wick shown in this illustration are instructive from several points of view. They were made to ascertain where the maximum power of a candle ends. Unlike the candles in B, the wicks are supplied with sperm not simply by capillary attraction, but also by the syphon action of the bend. This bend has a clear, glowing end, which looks into the "cup;" and for some time the black part of the wick does not increase, but remains stationary, as if the flame could not possibly burn down the wick. From this it would naturally teach us that the suction produced by

* The tables here referred to will appear, in their natural position, with the next instalment of this article.

the flame must be very great, since the upflow of sperm, which is melted by the heat radiated from the tip of the wick, is sufficient to keep up the demand. The candles do not visibly smoke, although they have large flames; and it is surprising to know that they yield less light per grain of sperm consumed than B candles. To account for this, some of the sperm goes off unburnt, as well as some not being raised to incandescence. This bend is soon consumed away, when it then attains more the curvature of the B candle wick, yet not the same. It also requires to burn a considerable time before it can acquire A's curvature, for the sudden reduction of the bend ultimately ends in nearly an upright position, which it is difficult for the flame to put right, on account of its peculiar end. In nearly all cases they burnt more than 126 grains of sperm per hour, and the readings were calculated to 120 grains.

Illustration D.—The results of experiments with candles having their wicks in an upright position are amazing; and much is to be learned from them. Candles develop the least possible amount of light per grain of sperm consumed when their wicks are in this position, although the rate of consumption of sperm is normal. The wick, however, is not consumed away; and as it becomes longer it obstructs more light, so long as it keeps within the flame which burns from it. The wick in this position is simply the generator, and as the gaseous sperm leaves it, it is at once made incandescent; for, unlike the other flames, there is no chamber of sufficient size to retain the gas for a definite period of time, so to ensure its combination with oxygen before it enters the chamber of incandescence. The only chamber the flame has, is the blue portion at its base. That which encircles the wick is luminous, but not to the same intensity as that surrounding the coalescent chamber—for it is nothing else, since it prepares the gaseous sperm for the incandescent zone or chamber—of B flame. The flame being circular, the oxygen cannot enter to its centre to crack up all the carbon particles; consequently, they are not fully raised to incandescence. The other flames are flat, and thereby offer more opportunity for the oxygen to combine with their carbon particles. The B flame facilitates this very much, partly owing to the wick being bent over (thus increasing the superfices of the flames) and partly to the small portion of flame beneath the wick which governs the whole flame, and other causes, as already pointed out.

(To be continued.)

TECHNICAL RECORD.

NORTH OF ENGLAND GAS MANAGERS' ASSOCIATION.

Half-Yearly Meeting in Newcastle.

The North of England Gas Managers' Association held their 28th half-yearly meeting in the offices of the Newcastle-upon-Tyne Gas Company last Saturday. Mr. W. HARDIE, jun., Engineer and Manager of the Tynemouth Gas Company (the President) took the chair a little after the advertised hour; the delay being probably owing to the programme of business not disclosing a very heavy day's work—a supposition which was falsified in the result.

APPOINTMENT OF SCRUTINEERS.

On the question of appointing Scrutineers in connection with the election of office-bearers coming up,

Mr. W. FORD (Stockton) expressed the opinion that it was a hardship that any of the members should have to leave the room while the business of the meeting was going on.

The difficulty was overcome by Mr. R. Main (Glasgow) and Mr. H. F. Burrows (Liverpool) undertaking the work.

THE ACCOUNTS.

On the motion of the PRESIDENT, the accounts for the year were passed.

NEW MEMBERS.

The following gentlemen were admitted to the Association: *Members*—Mr. P. H. Wilkinson, Manager of the Harrogate Gas-Works; Mr. C. Bainford Williamson, Assistant-Manager of the West Hartlepool Gas-Works. *Associates*—Robert Wallis, Esq., J.P., Chairman of the South Shields Gas Company; Mr. T. Havelock, of the Wear Fuel Works.

PRESIDENT'S OPENING REMARKS.

The PRESIDENT said that, before going on with the business, he should like to mention that, at their last meeting, he took the opportunity of referring to the illness of their Vice-President, Mr. J. H. Cox, jun., of Sunderland. He was very pleased to hear that Mr. Cox was now somewhat better than at that time. He had, however, not yet returned to England; but they all hoped that he would soon come back restored to health and strength. Under these circumstances, the Committee had thought it advisable that Mr. Cox should be retained in the position of Vice-President for the coming year. They also suggested that the Association should appoint Mr. Wallis as their President. Considering the long time Mr. Wallis had been so closely connected with the gas industry in the North of England, and in view of the interest he had shown in all subjects that had a tendency to increase the prosperity of Gas Companies, he (the President) thought the Association would act wisely if they elected him. As was known to a number of them, Mr. Wallis had had a great deal to do in bringing forward things to the advantage of gas undertakings. Many years ago, when the manufacture of sulphate of ammonia was almost unknown among gas makers, Mr. Wallis introduced plant for this purpose at the South Shields Gas-Works; and a few years ago he inaugurated the exhibitions of gas appliances which had become so very popular. They would all notice with satisfaction that a Royal Commission had been appointed upon the labour question. There was no doubt that there was much to be cleared up on this highly important subject; and he thought it very likely that much good would result from the deliberations of the Commission. He was pleased also to notice that Mr. George Livesey, Chairman of the South Metropolitan Gas Company—a gentleman who had always taken a great interest in working men, who had some idea, at any rate, of the operations of Trades Unions, and who had also had considerable success in dealing with his own workmen—had been appointed a member of the Commission. He (the President) had no doubt that his services there would be very valuable. The gas industry seemed to be still in a very prosperous condition. He noticed that with most of the local undertakings the increase in consumption was as much as it had been in the past, when they had fewer rivals.

Mr. DAVID TERRACE (Middlesbrough) then read the following paper:—

DISTRICT PRESSURE.

Although the science of the distribution of coal gas is now well understood, I apprehend that in a great many instances its principles are not carried out in their entirety. One of the reasons that may be adduced for this may be that the street mains, which are practically adequate nearly all the year through (excepting, perhaps, for two or three months in mid-winter), are made to do their work at the time of greatest demand by means of increased initial pressure. This may be considered sufficient for the time being; but when winter after winter passes, and more and more pressure has to be put on to meet the extra demands, I think it will be conceded that, at best, it is a clumsy, and often a very inefficient way of getting over the difficulty.

The premises are that gas must be used at a certain known pressure; therefore a continuous equal pressure should be maintained at the outlet of every consumer's meter, let such consumer be near or distant from the gas-works or other source of supply. In other words, we are entitled to give each his due within certain limits—say, between 10-10ths and 12-10ths of an inch pressure, which should be ample for all purposes of lighting, cooking, heating, and motive power. Indeed, 7-10ths would meet each of these cases, if the house fittings were of sufficient size for their work. It may be urged that it is scarcely possible to give such an equal pressure at all times, and that consumers within the range of high pressure (which may at times be from 20-10ths to 30-10ths) should guard themselves against it by using governors, &c. But as we have the means in our power of equalizing pressure throughout the town and district, these should be carefully adapted to furnish an ample gas supply, at a comparatively low pressure, to every consumer. This is all the more necessary as it is well known that the great majority of our customers do not trouble themselves concerning the manner in which gas should be used to arrive at satisfactory results in lighting, cooking, &c., either for efficiency or economy's sake.

The circumstances under which gas is distributed are sometimes very complicated; and this leads to each case requiring a somewhat different mode of treatment. I may here mention a few of the systems of gas supply in vogue: (1) Small towns, where the works have a station governor, with trunk mains in the principal streets—the mains generally diminishing in size towards their extremities; branch mains in side streets, also diminished; the cross streets supplied through mains connecting the side streets. (2) Large towns where the works have two or more station governors supplying mains leading in different directions of consumption. (3) Larger towns, with suburbs into which the trunk mains have been extended, and possibly portions of the mains nearest the works taken up and relaid by larger ones; consequently the remarks as to diminishing in size apply in a still greater degree. (4) Compactly-built cities with suburbs, which generally have two or more large gas-works stations for supplying from different points, and when under one company or corporation, have the trunk mains, &c., connected. (5) Cities or large towns, parts of the area of which are on hilly districts. These, in addition to having gas stations, may have district holders on different levels of supply; or the elevated districts may be zoned—*i.e.*, separate portions at certain altitudes supplied by a main to each (the pressure being controlled by district or differential governors), or by means of a main direct from the works, and the pressure governed therefrom. (6) Great cities, where the works are at such a distance as to occasion the use of exhausters to draw the gas from the outlet main, and deliver it through street mains to the consumers—a holder or holders intervening, which serve to contain the night stock, and also to ensure steadiness of pressure. (7) Combinations of the several foregoing methods or systems.

I have taken special notice of the general practice of diminishing the area of mains as the distance from the works increases. I think the trunk mains at least should be kept to their full bore throughout their entire length, for the reasons that the farther the gas travels the more is the pressure lessened, on account of the gas being drawn from the mains, and the friction is proportionally very much greater in small than in large mains. This points to the idea that, instead of decreasing, mains should be increased in size the farther they are from the source of supply. In the latter case, the pressure is likely to be more equable than in the former. The same remarks should, of course, apply to fittings in houses and other premises where gas is employed.

I was very much interested when reading, in the JOURNAL OF GAS LIGHTING for Sept. 2 last year, the account of the manner in which pressures are controlled in the district of The Gaslight and Coke Company of London. It is briefly this: A series of high-pressure mains interlace, so to speak, the ordinary street mains; joining them at certain points where a governor regulates from the high to the desired district pressure. A telephonic system places the whole in communication, so that a deficiency at any point is at once supplemented, and a surplus checked. It appears to me that this is the best and most efficient means of obtaining an equalization of pressure over towns and districts. The system, or a modification of it, would be applicable under almost any conditions of gas supply; and it would prove a preferable mode to enlarging portions of the trunk and branch mains, as the effect of doing this is sometimes of only problematical benefit, unless the whole system is revised on the lines indicated. That is to say, although greater carrying capacity may be given to certain streets or districts, the full effect intended may, and very likely does, fall far short of what would be expected.

Now that pressure registers are made portable, and to act without the slightest friction, they give a very exact and permanent record. They should be employed at regular intervals, especially during the times of greatest consumption, to ascertain the street pressures. I have here a diagram representing the pressures as simultaneously recorded at the gas-works, town, and district respectively. Several other diagrams were taken during the past winter at various parts of the district; but I have reproduced what may be termed the worst case in respect of district pressure. During the time of least consumption, the pressure lines keep nearly parallel; the difference being merely due to altitude, &c., whereas at the time of greatest consumption, the lines show the greatest divergence. The "Town" line shows the pressure at a point about 1000 yards from the works, and was taken from a 16-inch main, which is supplied first through a 24-inch main on the 18-inch, and then to the 16-inch. The "District" line shows the pressure on a 3-inch main situated about 3000 yards from the works. It should be stated that the average hourly consumption during lighting hours was about 150,000 cubic feet. It may be explained that the situation of the works is in a thickly-populated industrial area of about a square mile, which is termed the old part of the town. Just outside this, on one side of it, is the new part, into which the mains have been extended. It is from the 16-inch main in the centre of the new part of the town that the "Town" pressure diagram is taken. The original mains have been supplanted by the larger ones referred to, which in their turn should either be enlarged or the system advocated adopted—*i.e.*, independent high-pressure main or mains from the works direct to the new town and district.

The obligations of gas companies and corporations are becoming more onerous as regards a full and efficient gas supply during the whole of the 24 hours. Times were "easy," comparatively speaking, a few years ago, when lighting was nearly the only purpose for which gas was required. What we were inclined to grumble at then was the unproductive capital employed; and we wished for the time when the mains would be in use during the daylight hours. Now we have attained our desires—at least to a considerable extent; and we find that this brings duties along with it. In towns which are free from fogs, the demand is nearly constant. But when King Fog appears, then is the strain; and this has been very marked in several large towns during the past winter. Gas was wanted for lighting during the day; and to keep the ordinary "cooking" and "power" pressure on would have resulted in draining supplies reserved for evening hours. Hence, complaints were loud. We like the steady pull from the mains during the day, and every day; but when a few days' fogs appear—and they generally come when least expected—it is scarcely possible, with the present means at command, to cope successfully with them. Having the making power and holder room are ways of alleviating the difficulty; but even these prove futile during prolonged fogs, or dull, or very cold weather. Having the power to regulate the pressure to a nicety over the whole area of supply would prove another means whereby we could do more justice to our consumers. In some towns, this is done; but very much requires to be accomplished before it can be said that it is as universal as it should be.

Discussion.

The PRESIDENT said he hoped they would have some interchange of ideas on this very important subject. It was one with which they all had something to do; and most of them had had difficulties with it. He hoped, therefore, they would freely express their views.

Mr. J. HALL (West Pelton) said he had taken a great deal of interest in the important subject before them. A remark was made in the paper as to the pressure at the commencement of the delivery of the gas. If anyone looked up the reports of the West of Scotland Association, upwards of twenty years ago, they would see that in the town of Ayr he read a paper, on the pressure and distribution of gas, similar to the present one. In many cases they would find that the large pipes were at the wrong end of the system. In his paper he showed that it was at the place of delivery that their difficulty took place. Another point in distribution was as to the junctions. In connection with this, he found that by making them about double the usual size, and bell-mouthed, the inrush of gas was steady. His general experience was that there was a misapprehension as to main pipes, because where they should be largest they were usually smallest.

Mr. W. J. WARNER (South Shields) thought that, as an Association, they were indebted to Mr. Terrace, as they would be to any gentleman who would bring the subject of pressure again and again before such Associations as theirs. He considered it good to go through the whole of a district, month by month, to ascertain the pressures, both high and low. This gave them an indication of the distribution. He believed they ought to have a town districted—dividing the higher from the lower portions. In his district, some years ago, they separated the manufacturing from the suburban or residential portion of the town. They required a pressure (say) at six o'clock in the morning, on the river side, which was not wanted in the outlying districts. It would be found that (say) at Gosforth they did not need a pressure of 1 to 3 inches at that hour in the morning; but on the river side it was different. With reference to the equalization of pressure, he differed from Mr. Terrace. He thought they could scarcely have the whole of a district or town at fixed pressures throughout the entire 24 hours, even though their plant might be capable of delivering it, and the district round were suitable. He did not believe this would be satisfactory to the consumers. Speaking of very large works, he might say he was disappointed with the paper—not with the way in which Mr. Terrace had handled the subject, but because he thought they should have had some statistics.

Mr. J. HEPWORTH (Carlisle) agreed that probably not many members of the Association themselves knew what took place from time to time in the several parts of their supply outside their works. But there, before them, was a diagram which very distinctly showed them the pressure in the various parts of the town and in the outlying districts. If any argument were needed, the diagram contained it, by showing that a series of high-pressure mains, interlacing the supply, should be brought into use for the purpose of equalizing the pressure over the whole area of supply. If the diagram did not prove that, at all events it proved what a person in a small town would probably admit—that larger mains were requisite in order to equalize the pressure of gas over the whole area of supply. The subject of pressures was a very much wider one than the paper represented; and he felt that there were gentlemen in the room who had had experiences they could relate which would be very valuable. For instance, everybody did not live in such a flat district of supply as probably Mr. Terrace did at Middlesbrough. He himself came from a town where he had scarcely any difference at all in the levels; but he knew very well that in other places the levels were so interrupted that it was a matter of extreme difficulty to equalize pressure over a town of even smaller size than Carlisle. One point mentioned by Mr. Terrace was the greater necessity that now exists for giving an equal pressure during the varying requirements of the 24 hours. What they could do for the night consumption, they certainly could do for the day; and if the consumers' requirements were less in the daytime than in the evening, there could be no difficulty in arranging the supply over the whole 24 hours. The great thing was to endeavour to ascertain, as Mr. Terrace had done, what the pressures were. He thought the paper was a very valuable one.

Mr. V. WYATT (London) said there were one or two remarks in the paper which were perfectly correct, and which he found to be correct 23 years ago. At that time a great deal of discussion took place as to whether or not they should increase the size of the mains at the point farthest from the works; and the conclusion come to was that this ought to be done—that as the friction became greater so should the area of the main be enlarged to compensate for it. They did not make their pipes larger; but they compensated for it in this way: They put on an enormous pressure, of from 18 to 24 inches; and so they could send any quantity of gas through a 4-feet main to the distributing-pipes at the other end of the district. They used to have a leakage of 17 per cent., and now they had only 5 per cent.

Mr. H. LEES (Hexham) would have liked Mr. Terrace to have said something about the leakage account. He had found many cases in which the consumer had had an ample supply of gas at the meter, but did not get sufficient at the burner.

Mr. M. RICHLEY (Shotley Bridge) narrated his experience in supplying gas to collieries, and asked how the pressure in such a case could be regulated.

Mr. HALL, in explanation of this, said a good deal depended

upon the regulation of the steam-pipe. If the steam-jets were working right, every collier had his own proportion.

The PRESIDENT said he had listened with great pleasure and interest to the paper, which dealt with a subject he had at times found exceedingly difficult. When he looked over Mr. Terrace's diagram, he thought that really Middlesbrough must be a most blessed place to be in, for this reason—that the pressure all through could be maintained at a very low figure. In most towns a pressure of 15-10ths was required to give satisfaction; but he found that Mr. Terrace could satisfy people for a considerable part of the 24 hours with a pressure as low as 10-10ths, which must keep his leakage account very low. Besides this, he noticed that Mr. Terrace had, in outlying districts, the pressure at some periods of the day as low as 9-10ths. He should consider this would cause very great discontent, because Mr. Terrace had just told them that 12-10ths was the thing they might expect the consumer to be satisfied with; and therefore if the diagram before them were for a series of nights, he really did not know how Mr. Terrace managed it. In the case of having a gas-works at the highest part of the town instead of at the lowest, what seemed to be necessary was to take a leading main from the most elevated down to the lowest point, and then to allow the gas to rise again. In that case there must be a heavy pressure through the leading main; but as there was no consumption off it, the leakage was not high.

Mr. TERRACE, in replying, said he was somewhat surprised to find Mr. Hall's and Mr. Wyatt's experience agree with his own, in so far as they knew about this matter some twenty years since. It was rather a slur upon gas managers that, if these facts were before them so long ago, the larger mains should still be nearest the works. The facts could not have been satisfactory, otherwise gas managers would not have gone in the opposite direction. He did not think there was much in enlarged junctions, provided they had a junction which was of full size. It would possibly be an advantage; but it was a question whether it would be worth while. It was said that they should have pressure to suit the demands of different districts. What he said they should do was to set their house in order, and give a better supply at a lower initial pressure. He was surprised, when he went to Middlesbrough, to learn that they could do with so little pressure; for 12-10ths during the day-time was abundant. He had no complaints whatever of the pressure at night, except in the district shown on the diagram. It was certainly a fault; and this was the reason for his ventilating his experience before the members. In that district which had a very low pressure at night, if they put on pressure at the works it did not reach the point of supply. Suppose they put on 25-10ths at the works, it would be only 10-10ths in the district. Up to this time the leakage in Middlesbrough had been about 10 per cent.; this year he should be able to bring it down to 7 per cent. This was not being done by reducing the pressure, but by rectifying something that was wrong inside the gas-works. This circumstance showed how careful they should be in looking into everything connected with their works. He thanked them for the kindly reception they had given to his paper.

Mr. WYATT, in explanation of the point that additional pressure did not mean greater leakage, said that in the 4-feet mains in London, whatever the pressure might be, there was no increase of leakage; the mains were simply big gasholders.

The PRESIDENT then read the following paper prepared by his father, Mr. William Hardie:—

SHOULD OWNERS OF GAS-WORKS BECOME TAR AND AMMONIACAL LIQUOR DISTILLERS?

The question which I have suggested for your consideration is an important one for companies and corporations who are owners of gas-works. It was incidentally alluded to at our last meeting by the President, as well as by Mr. Bower; and it has also been discussed at other Association meetings. The Legislature evidently seems to have been under the impression that owners of gas-works might work up their tar and liquor; as, in recent Acts of Parliament, clauses have been inserted giving these bodies power to utilize residual products—such powers, however, not to prevent them from being liable to indictment for nuisance to which they might be liable in consequence of such operation. Very few companies have availed themselves of this power, so far as the distillation of tar is concerned. Out of 80 of the largest companies in England, there are not more than seven who are tar distillers; and those, for the most part, only carry the distillation to the recovery of the primary products. The Gaslight and Coke Company, I believe, are different, as they manufacture with the tar several distinct specialities—such as benzol, anthracene, and other articles. Why have so few gas-works a tar distillery? One reason is that, in many cases, the works are situated in the centre of large towns; and the addition of a tar manufactory might be considered a public nuisance. I know that in Newcastle, many years ago, the Company distilled their tar; but, while it lasted, they were continually being found fault with for causing the emission of bad smells and other noxious effluvia. Although committees of scientists were engaged to investigate the matter, they never arrived at a satisfactory solution. By no process of reasoning could they trace the alleged smells to the tar-works. Still, the agitation continued; and in order to allay it, the works were discontinued, and the tar sold to a contractor. In addition to the nuisance that is supposed by some people to arise from tar-works, there is also the apprehension of danger; and under this head we have certainly had some terrible experiences in this neighbourhood by two very destructive fires, accompanied not only by loss of property, but also by the sacrifice of valuable lives. However, I think that, with increased experience which has been gained as to the management of such works, there is no doubt of their being carried on with practical safety. Still, the fact remains that, with the facilities possessed for establishing tar-works, companies and corporations are not generally disposed to take advantage of them; and so I think we may conclude it is desirable to leave them alone.

Under these circumstances, the question arises as to the means of making the best of the other alternative—viz., the selling of the tar. Here, to my mind, comes in the propriety of a sliding scale, so that the benefit of the market value may be secured. Of course, a sliding scale may not be of service when the tar is sold only for one year, or even for two years. A fixed price may then be resorted to; but where a contract is to last three, or five, or seven years, a sliding scale will be found the fairest both for seller and buyer. On what principle, then, would you base your sliding scale? In one place, I find that the tar is sold at a price which is fixed by a mutually chosen arbitrator. In other places, it is decided by the profits made on the article by some large distiller; and as The Gaslight and Coke Company are, perhaps, the largest tar distillers in the world who publish their accounts, advantage is taken of these to find the price. A clause is inserted in the agreement with the contractor which stipulates that the price to be paid by him (say) for a half year shall be at the rate of so much per cent. of the price realized by The Gaslight and Coke Company during the same period for all the tar distilled at the gas-works at Beckton, or sold by them. The accounts of the company are made up every half year; and whatever difference there may be between the price charged to the contractor for the previous six months and that realized by the company for the same period, is then adjusted. This system has been in use by several companies in this neighbourhood for some years, and has given satisfaction to both sides. I commend it to your consideration.

But while gas manufacturers keep aloof from the distillation of tar, it is altogether different with the production of ammoniacal liquor. Although, as I have said, only seven of the largest gas-works distil their tar, nearly 50 out of the same number manufacture sulphate of ammonia. This is not only the case with the large works, but also with a very great number of small ones. It may be assumed, then, that it is desirable for owners of gas undertakings to make sulphate. This being so, those who enter upon the business should endeavour to ascertain the most profitable means of carrying it on. Under this head, it is surprising what marked differences there are in the results obtained. I find that the quantity of sulphate made per ton of coals carbonized varies enormously. In some places it is as low as 17 lbs.; in others, as high as 32 lbs. Of course, one reason of the difference is the kind of coal used. The best results are obtained from Wigan and Yorkshire coal. The users of these coals get, on an average, about 26 lbs. per ton; on the other hand, where Durham coal exclusively is employed, the results may vary from 17 to 26 lbs.—the average being 19½ lbs. While it would seem right, then, for gas-works to have associated with them sulphate of ammonia works, there is much to learn as to the proper *modus operandi* for producing it. There may, indeed, be local circumstances influencing greatly individual cases; but the subject is one that is worthy of the most careful attention. Those who are not doing so well in this department might consult, to their advantage, those who are doing better. The highest score reached by Durham coal, so far as I know, is that obtained by our neighbour West Hartlepool, where they get 26 lbs. of sulphate per ton of coal carbonized. A few pounds more sulphate per ton of coal means, in the cases of small works, hundreds of pounds, and in the case of larger ones thousands of pounds, more income per annum.

From the facts, then, which I have brought before you, I think it appears that it is advisable for owners of gas-works to go in thoroughly for the distillation of ammoniacal liquor, while they may allow the tar to go to the best bidder; always provided, however, that the competition for the article is a fair one, and that there is no combination among buyers to keep the price down, in which case I should certainly say, "Start works of your own." My remarks are short; but if they are of any service to you in the elucidation of the important question I have dealt with, I shall be glad.

Discussion.

Mr. V. WYATT stated that some ten or twelve years ago, when they were finishing the works at Beckton, he came down to Newcastle and proposed to the late Chairman of the Newcastle and Gateshead Gas Company a scheme for a great district factory for the treatment of gas products, to which all the products of gas-works within 100 miles might be sent. By means of such a factory, they could regulate prices and get rid of the middleman. He got the idea from the central butter and cheese factories in the United States, to which the farmers forward

their milk, and had a return equal to the quantity they sent. His opinion was that they could creosote sleepers, make tar pavements, and all the other derivatives from tar; and that they would get the profits to themselves—being able, he believed, to clear 50 per cent. The scheme, however, was not proceeded with. But, as the members knew, it had been carried out at Beckton, exclusively for the benefit of one Company; and it might also be carried out at Newcastle. They could have their own railway stock, and a communication from the railway to the works. He knew one Railway Company who creosoted their own sleepers; and members would be astonished to know the profit they made upon it. He noticed only recently in the JOURNAL OF GAS LIGHTING that in the United States tar was becoming so valuable that it paid to send it 1200 miles. It would become still more valuable; and it should be the object of gas companies to get these things within their own grip, rather than let the outside public take cash out of their pockets.

Mr. W. J. WARNER thought it was due to the gas managers and engineers situated on the banks of the Tyne to say that the idea which Mr. Wyatt had propounded was not an original one. He remembered, many years ago, talking of it with Mr. Hardie. It was patent to them that there were tar distilleries in the district which were common to them all; and that, by a combination, they could work up their residual products, to the advantage of the companies in the district. He believed there was one thing which would prevent such a proposal being carried out, and that was that gas companies had not power to do such a thing. They would require to get special powers.

Mr. WYATT remarked that he intended there should be a special company.

Mr. WARNER said that was so. It seemed clear to them that there were very large profits on asphalt, tar pavement, and in the numberless other directions in which tar was being consumed, and that, in addition, they had their noble river, upon which products could be shipped from the gas-works at almost an enormous profit; but they had not the power to go on with it. Mr. Hardie had introduced a very important subject. It was one that had often been talked over; and he hoped the time was not far distant when it might be found to be to the advantage of gas companies, as well as of consumers, that there should be a combination of companies to work up the residual products. He was much obliged to Mr. Hardie for his really valuable paper, which he thought was one of the best that had ever been laid before them.

Mr. J. HALL thought that the distillation of tar might be done in a combined way. Managers of large works might distil their own tar; but in small works it would be found to be very difficult. Some people said, "Put down the gas companies;" and the electric light people said, "Let us extinguish them altogether." Why should they not therefore go into this matter, and so help each other?

Mr. G. PETTIGREW (Gateshead) stated that within the last eighteen months they had begun to manufacture sulphate of ammonia. Formerly they used to get £160 a year for their liquor; but now they made a profit of £600 out of it. He was of opinion that it would pay in small concerns to work up the products. The distillation of tar was a thing which he at one time intended to take up; but, for want of space, he had been obliged to abandon it.

Mr. WYATT explained that, speaking generally, tar distillation could only be undertaken in large works. The nuisance was very great. At Beckton they found that in certain states of the wind the vapours were carried for three miles before they condensed and were deposited. They had to make special provision to deal with it; and this a small company could not do.

Mr. WARNER observed that within the last two or three months the large tar distillers on the banks of the Tyne had had to remove their works to the Wear; so that the produce of the many thousand tons of coal which were carbonized on the Tyne had to be carried over to the Wear to be worked up at a very great cost. This, in their own case, had absorbed a portion of the increased price they obtained for tar.

Mr. C. SELLERS (York) said he should like to have just one word of explanation from Mr. Warner. He was in thorough sympathy with the proposal that there should be combination among gas companies for the distillation of tar; and, in his opinion, great advantage would arise from it. At his works only sulphate of ammonia was manufactured; and it might be difficult to get a combination to carry out the manufacture of sulphate. Mr Warner had said that there would be some difficulty, as the companies had not the necessary legal powers to enter into a combination as suggested. He did not himself perceive where the difficulty came in. If the Acts of Parliament authorized gas Companies to distil tar in their own works, he did not see the difference between that and transferring the power to works owned by a number of companies. He should like to hear Mr. Warner explain what he meant. If the thing were practicable, he should say that something ought to come out of this discussion; and he would propose that a Committee should be formed to consider how far it could be carried out, so as to test whether or not they could get the benefit which he believed they would have if any combination could be effected.

Mr. WARNER said he was an engineer and not a lawyer; but to his mind it appeared that, when they obtained powers for a certain purpose, they had no power to manufacture anything else beyond the bounds which were scheduled. Their capital was for certain specific purposes; and he did not think it could be applied to any other object.

Mr. ALLAN (Wallsend) said he was afraid their shareholders would not agree to the proposal; and they would have to get an Act of Parliament giving them the necessary authority.

Mr. WYATT stated that The Gaslight and Coke Company had formerly no powers to distil tar; but they went to Parliament and obtained them. In the same way, they could form a separate company in the North.

Mr. W. FORD (Stockton) pointed out that The Gaslight and Coke Company were selling gas at a very much higher price, though they manufactured their residual products, than did the South Metropolitan Gas Company. The analogy, he thought, might be carried farther; and it might be said that private undertakings might be better able to yield as good profits as would such large monopolists. He remembered the time when gas managers were allowed, as a perquisite, to manufacture residuals, for the sole purpose of getting rid of them; and his opinion was that, if gas manufacturers continued in the steady progress of their own business, the tar and ammoniacal liquor might be left in the hands of their employers. No one would say that ammoniacal liquor could not be distilled on the spot at a very high profit; but, on the other hand, there was such a diversity of opinion as to tar products, that he was very much afraid it might not pay gas companies or corporations to distil tar. After having been once or twice through the still, tar got into such a scientific class of article that no gas manager could attend to the elaborate processes that were required to produce the finer products, with a due regard to the duties to the public incumbent upon him as a gas manager. If they made him a scientific chemist, his duties as manager could not be looked after; because, as gas manager, he had to deal with the men in the retort-house and with the public, and the latter did not care whether or not the gas company made a large profit. It ought not to go out from the Association that the tar distillers had robbed the gas companies. ("No, no.") As a tar distiller, he knew something about it; and he thought he could interpret the remarks to mean that gas companies had been rather "diddled" out of their profits. It was the business of gas companies and corporations to manufacture gas as pure as possible, and to sell it as reasonable a price as they could; but he said let the day be far distant when they should form into a syndicate in a district to work up the tar. A corporation had no right to pledge their rates to come into competition with the private distiller. This country had been built up by individual effort; and if they ever came to the time when one man would manufacture for the whole universe, that would be a bad day.

Mr. SELLERS disclaimed any intention of insinuating that tar distillers had been cheating them. No such feeling was in his mind, because, if he had insinuated that, it would have implied that gas managers were a set of simpletons, and men who did not know their business. There was quite sufficient competition among tar distillers to enable gas managers to get a fair price for tar. Mr. Ford had a great idea of this country, but no greater than he (Mr. Sellers) had; nor had he a higher opinion of individualism. But they saw that all businesses were being carried on by combinations; and they might expect that these would become more common.

Mr. HEPWORTH was afraid they had discussed Mr. Wyatt's remarks rather than Mr. Hardie's paper; but they had had an interesting discussion all the same. He did not agree with Mr. Hardie in thinking it desirable that they should leave tar distilling alone. Why was it desirable, if the works were situated outside a town, where no nuisance could be complained of, and if they were sufficiently large to permit of the operation of tar distilling being carried on, that they should not engage in it? He dissented altogether from this conclusion. Then, as to the sliding-scale arrangement proposed by Mr. Hardie, he did not think it was in the power of man to conceive a fairer mode of arriving at the price to be paid for tar. It was very much wiser, he thought, for a gas company to accept short contracts, of (say) twelve months, for residuals, than to enter into contracts for such long periods as seven years. It would be found in the end, he believed, that a succession of short contracts entered into would have realized as good a price, on the average, as any other arrangement. Everybody was a sulphate of ammonia maker now-a-days. There might be gentlemen, however, whose make of gas was only (say) 5 million cubic feet per annum; and it was a question whether they should become manufacturers of sulphate of ammonia. He hardly thought they should. He certainly looked in the direction which had been suggested, of having a combination of works; but he believed legal difficulties stood in the way of their joining and forming a company for the distillation of tar. But that was a difficulty which could very easily be overcome, even if it required an Act of Parliament. What he would suggest would be an Act authorizing gas companies making tar to combine; and this should be obtained without very much difficulty. In Scotland, for instance, there were many small gas-works which had no Special Act of Parliament; and there was nothing to prevent them sending their products to such a combined works, and getting, *pro ratâ*, their share of the profits realized. There was one statement in the paper to which he listened with some surprise, and it was this—that in one works as much as 32 lbs. of sulphate per ton was obtained. If he knew where these works were, he should be very happy to go there, and get a lesson in

sulphate manufacture, because he had never had so great a yield. He thought they were all very much indebted to Mr. Hardie for his paper.

Mr. HARDIE, in reply, thanked the members for the kind attention they had given to the paper, and also for the remarks they had made upon it. He put it down, as a general rule, that gas manufacturers should not be tar distillers; but if they could find a town where it would not be a nuisance, then they might possibly go in for it. In towns, however, of fastidious tastes, he thought it must be a very dangerous business to engage in. Mr. Wyatt's proposal for a combination tar-distilling company was an important one; but he rather agreed with Mr. Warner that they had no power for such a purpose. His mention of the 32 lbs. of sulphate per ton of coal was a detail; but Mr. Ford made 26 lbs. out of Durham coal, and this was very good.

Mr. HEPWORTH added that in some gas-works where sulphate of ammonia was manufactured, they purchased liquor from works where they did not manufacture; and the 32 lbs., or whatever their yield might be, was possibly calculated upon this, and not upon the quantity of coal carbonized in the works.

ELECTION OF OFFICES.

The PRESIDENT intimated that the following gentlemen had been elected to hold office in the ensuing year: President, Mr. Robert Wallis, J.P., Chairman of the South Shields Gas Company. Vice-President, Mr. J. H. Cox, jun., of Sunderland. Auditor, Mr. J. H. Penney, of South Shields. Secretary, Mr. W. Hardie, of Newcastle. Committee: Mr. D. Terrace, of Middlesbrough; Mr. W. Hardie, jun., of Tynemouth; Mr. C. Sellers, of York; and Mr. W. J. Warner, of South Shields.

THE MEETING OF THE INCORPORATED GAS INSTITUTE.

Mr. T. BOWER (West Hartlepool) proposed that the Committee of the Association be authorized, in respect of the honour done to the Association by the election of Mr. Hepworth, one of their members, as President of the Incorporated Gas Institute, to arrange for the entertainment of the members of the Institute to a smoking concert, on the occasion of their forthcoming meeting in Carlisle. They had, he said, a balance of £62 10s. in hand, which, it was estimated, would more than defray the cost of the entertainment.

Mr. FORD seconded the proposition, which was agreed to.

Mr. HEPWORTH returned thanks to the members for their kind offer, but stated that it was a question whether it could be accepted; and he asked that the matter should be left to himself and the President of the Association to ascertain if the entertainment could be given. It would, he said, be very agreeable to himself, if it were possible.

On the motion of Mr. FORD, seconded by Mr. HEPWORTH, a vote of thanks was accorded to Mr. W. Hardie, jun., for his kind and courteous behaviour in the chair during the year.

The PRESIDENT briefly acknowledged the vote; and this concluded the business of the meeting.

The members and friends afterwards dined together in the County Hotel.

THE BUENOS AYRES CO-OPERATIVE GAS-WORKS.

In the JOURNAL for Nov. 4 last year we published some particulars in regard to the new works designed and carried out by Mr. G. E. Stevenson, M. Inst. C.E., for the Buenos Ayres Co-operative Gas Company. We are now able, through the courtesy of Mr. Stevenson, to give drawings and descriptions of the principal portions of the works; the first plate of the series—the general plan—accompanying the present number.

The construction of the works about to be described, occupied a period of something like 2¼ years. They were finally completed and transferred to the Company who purchased them (the Argentine Gas Company, with whom the Co-operative Company amalgamated) in December of the past year. Six contracts were concerned in the execution of the work, one of which was for the sulphate of ammonia and tar distilling plant, and was practically a supplement to the general contract for the apparatus and iron work—being undertaken by the same contractors. Excluding this from consideration, the five other contracts were: (1) Foundations; (2) buildings; (3) apparatus and ironwork; (4) retort-settings; (5) doors and windows. The last contract was kept separate from the general building contract, because the number of doors and windows was very considerable, and it was preferred to contract for them at first hand instead of allowing the builder to subcontract them, as he would have done if they had been included in his contract.

General Plan of the Works.

The shape of the ground plan of the works, as will be seen from the plate, is not the most desirable; but, such as it is, it was necessary to make the best of it—the land having been purchased previous to consulting an engineer in regard to the design of the works. The Engineer was desired to plan on the site purchased, complete works of as large manufacturing capacity as could be conveniently constructed thereon. The design provided for a make of 1,500,000 cubic feet of gas per diem and storeage for 1,200,000 cubic feet. The site was bounded by a branch of the Western Railway on one side; and it was decided to provide a siding entering the coal-store. The railway was on an embankment, and had a decline of about 1 in 150 towards the junction of the siding, where the level of the rails was 1½ metres above that of the site. It was determined to raise the level of the yard by 5 feet; thus bringing it to the level of the rails, and also lifting it above the possibility of being inundated by floods, which frequently occur in this particular neighbourhood.

Foundations.—The ground consisted of some 4 feet of vegetable soil and sandy earth, beneath which was a bed of muddy clay 5 feet thick, and below that a marl of variable hardness called "tosca," but which constituted a good foundation for heavy constructions. The foundations of the buildings were excavated 3 feet lower than the original level of the ground, and 2 feet of Portland cement concrete put in; the brickwork being started 1 foot below the ground, to avoid exposure of the footings on the outside of the boundary walls. The foundations of the chimneys, and also those of the tower scrubbers, were carried down to the "tosca," 9 feet lower than the original level, or 14 feet below the finished yard level of the works. The water-level in the subsoil stood at 4 feet below the surface, or at the top of the clay; but it rose higher at times in wet weather. The excavations of the annular cast-iron gasholder tanks were made to a depth of 15 ft. 6 in. below the original ground-line; there being 20 ft. 6 in. of the tanks in, and 10 feet out of the ground after the works were completed. The excavations entered 6½ feet into the "tosca," which at that place was so hard that it was impossible to work it with the pick; and it was therefore got out by dynamite. A narrow channel was cut round on either side of the annulus; and the "tosca" was divided by cross channels into blocks of about 12 feet square. A single dynamite cartridge was then introduced into the centre of each block; and the discharge split it up into small pieces that could easily be removed by the winch. The foundation contract included the excavations for the gasholders, the construction of the tar and liquor tanks, and all foundations of walls, chimneys, and apparatus, up to the finished yard level; and also the filling in and raising of the ground within the works.

Buildings.

The building contract comprised all the constructions of brick above ground as follows: (1) The retort-house, with its two chimneys and the coal-store attached; (2) the exhauster, boiler, and pump house, with its chimney; (3) the purifying shed; (4) the stores and workshops, together with the laboratory and photometer-rooms and the meter and governor house; (5) the residence and offices and the entrance gateway; (6) the weigh-house and clock-tower; (7) the stokers' mess and bath rooms and the closets; (8) the sulphate of ammonia factory, with its chimney. The buildings were constructed of native hand-made bricks in lime mortar; the joints being afterwards raked out and pointed with cement mortar. They were ornamented with bands and mouldings in cement; and the arches were rendered in cement. The bases of the chimneys were built of common brickwork; and their shafts above the base mouldings were of machine-made bricks of English shape laid in cement mortar.

The following is a list, translated from the specifications, of some of the materials and mixtures stipulated to be used in the building contract:—

No. 1.—Ordinary hand-made bricks of good quality, well formed and well burned, and of uniform colour, and of the dimensions required by the specified thickness of the walls. (The bricks which worked to the dimensions of 1 ft., 1 ft. 6 in., 2 ft., &c., were 28 cm. by 14 cm.; and their thickness was 5 cm.)

No. 2.—Machine-made bricks of English form and dimensions.

No. 4.—Fire-bricks provided by the Company, at the price of 70 dols. per 1000.

No. 6.—Blue bricks for floors supplied by the Company at the price of 80 dols. per 1000.

No. 8.—Fire-clay supplied by the Company at the price of 60 dols. per 1000 kilos.

No. 10.—Lime mortar composed of 1 part of Azul lime, 2 parts of Montevidean sand, and 1 part of brickdust.

No. 11.—Cement mortar, composed of 1 part of Portland cement of approved mark, and 3 parts of Montevidean sand.

No. 12.—Cement mortar for rendering, composed of 1 part of Portland cement and 2 parts of fine Montevidean sand.

No. 13.—Lime mortar for plastering, composed of 1 part of lime paste, 1 part of fine sand, and 1 part of brickdust.

No. 14.—Cement mortar for pointing, composed of 2 parts of Portland cement, 1 part of Montevidean sand, and 1 part of brickdust.

No. 15.—Concrete made of 1 part of Portland cement and 4 parts of coarse Montevidean sand (for imitation of stone-work.)

No. 16.—Concrete made of 1 part of Portland cement, 3 parts of broken bricks, and 2 parts of coarse Montevidean sand (for foundations.)

The foundattons having been previously prepared up to the ground-line, the building contractor commenced by laying a dry course of asphalte on the foundations, as indicated by the specification, as follows:—

Dry Course.—First of all the contractor shall commence the

works by laying a dry course of asphalte mixture of ½ inch thickness on the foundation of the buildings, to prevent the rise of damp in the walls.

Walls.—The dry course being laid, the contractor shall proceed to construct the walls of the buildings. These shall be built with lime mortar (No. 10). They must be built in straight and vertical lines. The bricks to be laid in English bond; each course being laid perfectly level, and having the joints as close as possible. All the walls of each building must be raised simultaneously. The contractor will not be allowed to advance with and complete one part of a building before commencing the other parts, nor to delay one part while he concludes the remaining parts. No difference in height of more than 2 metres between the different parts of a building will be permitted.

THE SOURCES OF PETROLEUM AND NATURAL GAS.

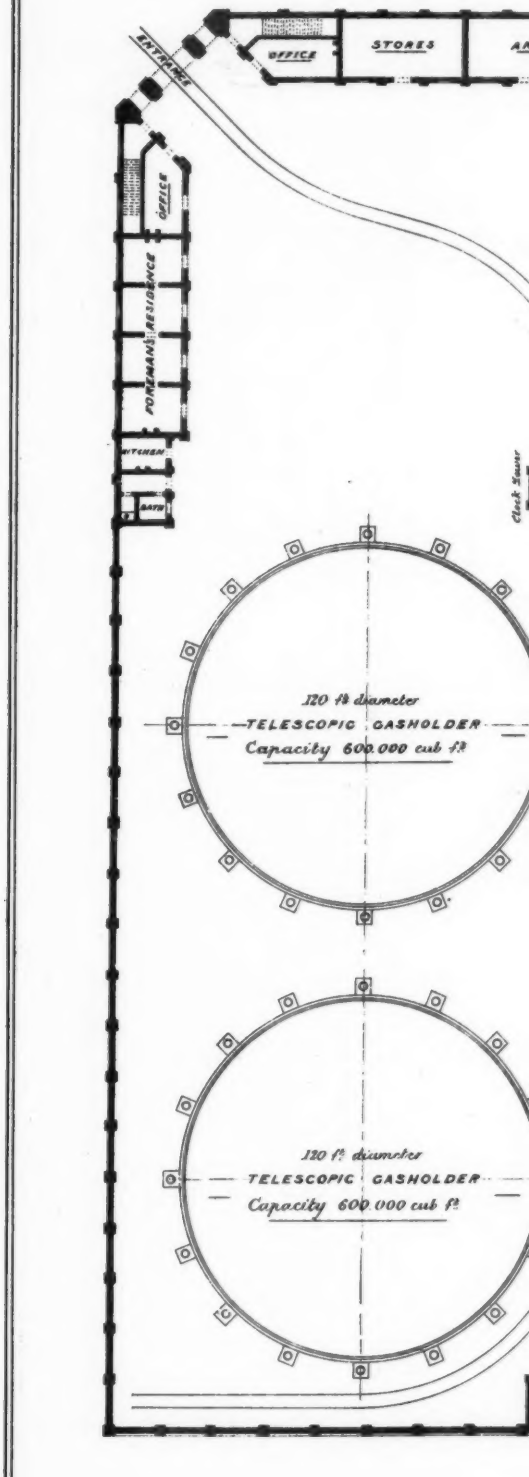
At a recent Meeting of the Society of Arts, a paper on the above subject was read by Mr. W. Topley, F.R.S., of the Geological Survey of England. The author gave a general review of the geological conditions under which petroleum and natural gas occur in different parts of the world; illustrating his subject with a number of tables and diagrams.

Dealing first with the origin of petroleum, Mr. Topley referred to the various theories which have been advanced on this question. For example, Professor Mendeleef and many Russian chemists believe that petroleum has a purely chemical origin; having been generated by the downward passage of surface water into regions of the earth's crust where metallic iron, in combination with carbon, exists in a highly heated state, or by water containing carbonic acid being carried down to regions where potassium and sodium exist in a metallic condition. Similar views have been advocated in France by Bertholet and others, and in this country by Mr. W. Anderson. The American geologists and chemists, on the other hand, are agreed that petroleum has resulted from the decomposition of the fossils in the shales and limestones of the silurian and Devonian rocks—chiefly the remains of animals, but in some cases also the remains of plants; and that the gas and petroleum thus formed are stored in porous sandstones and limestones, and are prevented from escaping by a covering of impervious shale. That the organic theory of the origin of petroleum best explains the facts over the greater part of North America, Mr. Topley considers is beyond question. It probably also serves best for most areas. But since chemists admit that the inorganic theory is a possible one, it may perhaps explain the facts for some other regions. For the future supply of petroleum, the question of its origin is one of prime importance. If it has resulted from the decomposition of animal or vegetable remains, the supply, however vast and seemingly inexhaustible at present, must needs be limited, and each area will in time be drained. If, however, petroleum is due to chemical action in the interior of the earth, the supply may be practically inexhaustible in the districts where it is thus formed. Baku may therefore sustain its reputation long after every petroleum field in the United States has run dry. The fact that, even at Baku, the supply is decreasing, is no valid argument against the inorganic theory, as it is quite possible that the petroleum, however originally formed, may have been stored, to a vast extent, in porous beds. When the storeage reservoirs are drained, we shall depend upon the steady supply from the earth's internal laboratory; but when the reservoirs which have been filled from the decay of animal and vegetable organisms are exhausted, there is no further supply to come, or, rather, the supply from the continuous decay of such organisms would be so insignificant as to be left out of account altogether.

Leaving the question of the possible origin of petroleum and natural gas, the author proceeded to ascertain under what geological conditions they occur in some typical cases. He showed that the general rule in Pennsylvania, New York, Ohio, Indiana, and Canada is that they are stored in porous sandstones or limestones, where the rocks have been gently folded into anticlinal ridges; or where, if there is a small and general dip of the strata, the dip is for a space interrupted (forming a shelf of more nearly horizontal rock), after which the strata resume their normal gentle dip. If the underground range of these petroleum-bearing beds are traced beyond the areas in which they are now productive, it is found that they rise towards the surface, and often actually crop out there; but the gas and petroleum which they may have once contained has long since been lost. Like other porous rocks in such areas, they now contain water. It is the pressure of the water from the outcrop and the higher areas of the porous rock, acting along and down the dip, which accounts for the pressure of the gas and petroleum within the productive areas. When the porous bed containing gas or petroleum is tapped by a bore-hole, the contents are forced up by the pressure of the water from the outcrop; the pressure depending upon the relation between the level of the outcrop and the point at which the porous bed is tapped. In fact, the condition of things somewhat resembles that so well known in the case of artesian wells. Mr. Topley went on to say that the early history of Canadian petroleum is interesting, inasmuch as Dr. T. Sterry Hunt, who well studied the subject, was perhaps the first geologist who clearly understood the true geological history of American petroleum. He showed, in the first place, that the oil was produced, in or near the beds in which it is found, by the decomposition of the vegetable or animal remains; next, that the porosity of the sandstones or limestones is sufficient to account for the great stores of petroleum they contain; and, lastly, that petroleum and gas mainly occur along anticlinal lines. The comparatively simple structure of the petroleum region here described is not, however, universal. The strata in which oil occurs often dip at high angles, or they may have been sharply folded and broken, the denuded edges of the petroleum-bearing bed being exposed at the surface. In such cases the yield of wells is comparatively small—there being no artesian pressure to force up the oil. Such regions rarely now contain much gas. Although there is much variety of geological structure in petroleum-bearing regions, there is frequently an anticlinal arrangement of the strata—the oil coming up along the arch. There is no uniformity in the geological ages of the strata which yield petroleum. Even in North America the age ranges from the lower silurian to the tertiary. Both gas and oil also occur in the drifts. In Europe, only small quantities are met with in Palæozoic rocks. In Holland it ranges from trias to cretaceous. In Eastern Europe it is mainly tertiary; and wholly so in the Caucasus. In other parts of the world the petroleum-bearing beds are, so far as is known, rarely of older date than the upper secondary.

Passing on to deal with the petroleum fields of the United States, Mr. Topley acknowledged his indebtedness to the report made by Mr. T. F. Carll on the "Oil and Gas Regions," contained in the Annual Report of the Geological Survey of Pennsylvania for 1886. It seems that the petroleum of this State was known to the Indians before the white men entered the country. It was used by them for medicinal purposes; while there is good reason to believe that the races who preceded the Indians were acquainted with it. Petroleum and gas in deep wells and borings seem to have been discovered accidentally in 1814, in Ohio, when endeavouring to obtain salt and brine. In 1829, a rather remarkable event occurred near Burkesville, Cumberland County, in Kentucky. In boring for salt water, oil was struck, which discharged many barrels at intervals of from two to five minutes. After spouting in this way for three or four weeks, the flow became constant at several thousand gallons per day. Although the importance of boring for oil should have been apparent from the success of the accidental trial in Kentucky, and from others in Alleghany, it is curious that no systematic attempt to drill for oil was made till 1859, when Mr. Drake, the Superintendent of the Seneca Oil Company, put down the famous well named after him at Titusville. This was only 69½ feet of an oil-bearing bed; and the oil rose to within 10 feet of the surface. The well produced at first 25 barrels a day by pumping; but afterwards the yield fell to 15 barrels. Numerous wells were drilled during the following year (1860); and in 1861 the first "flowing well" was obtained, on Oil Creek. At once many others were bored—some flowing at the rate of from 2000 to 2500 barrels per day. Wells were quickly driven in other areas, and the oil industry rapidly developed. The first pipe for the transport of oil was laid in 1865. In accounts of the earlier explorations for petroleum there is little said as to natural gas, which probably escaped into the air; and it was only met with in quantity and under pressure where deep borings were carried out. As far back, however, as 1821, natural gas was used in a small way for lighting houses at Fredonia, in Chatuaqua County, New York. No further development of the product seems to have taken place till 1870, when gas-engines were run by natural gas at Pine Grove, in Vernago County. In 1872, gas was discovered at Newton, and was laid on in pipes to consumers for fuel and light. It was used in iron making at Leechburg in 1874.

With regard to the petroleum productiveness of the several States, Mr. Topley considered first Pennsylvania, New York, Ohio, and Indiana. The geological position of the gas and oil bearing rocks range from the lower silurian (Trenton limestone) to the lower carboniferous. Until the great stores of the Trenton limestone were discovered, the Devonian strata were perhaps the most important source. When gas or oil are found stored in limestone, they may sometimes have been produced in the limestone itself; but the impervious cover of shale is still required to retain them. The Trenton limestone, the chief source of gas and oil in Indiana, and an important source now in Western Ohio, is the upper member of a series of limestones which have been proved to a depth of 1800 feet. The early borings revealed the presence of gas and oil bearing sands, which are generally underlain and covered by shales. The underlying shale is the source of the petroleum and gas; the sand is the porous reservoir in which they are stored; and the overlying shale is an impervious cover which retains them in the reservoir. The storeage capacity of the porous sandstone and limestone is very great, and sufficiently accounts for the great yield of the wells. The Waterlime bed, 500 feet in thickness, and with a capacity of only 0·1 per cent., would contain 2,500,000 barrels of oil per square mile. A hundred square miles of such rock would yield the entire production of New York and Pennsylvania up to January, 1883. But the capacity for storeage is often much more than the figures taken here. Mr. Carll, whose work has already been referred to, has shown that some rocks can contain from one-tenth to one-eighth of their bulk in oil. The richly productive areas of the Trenton limestone are over



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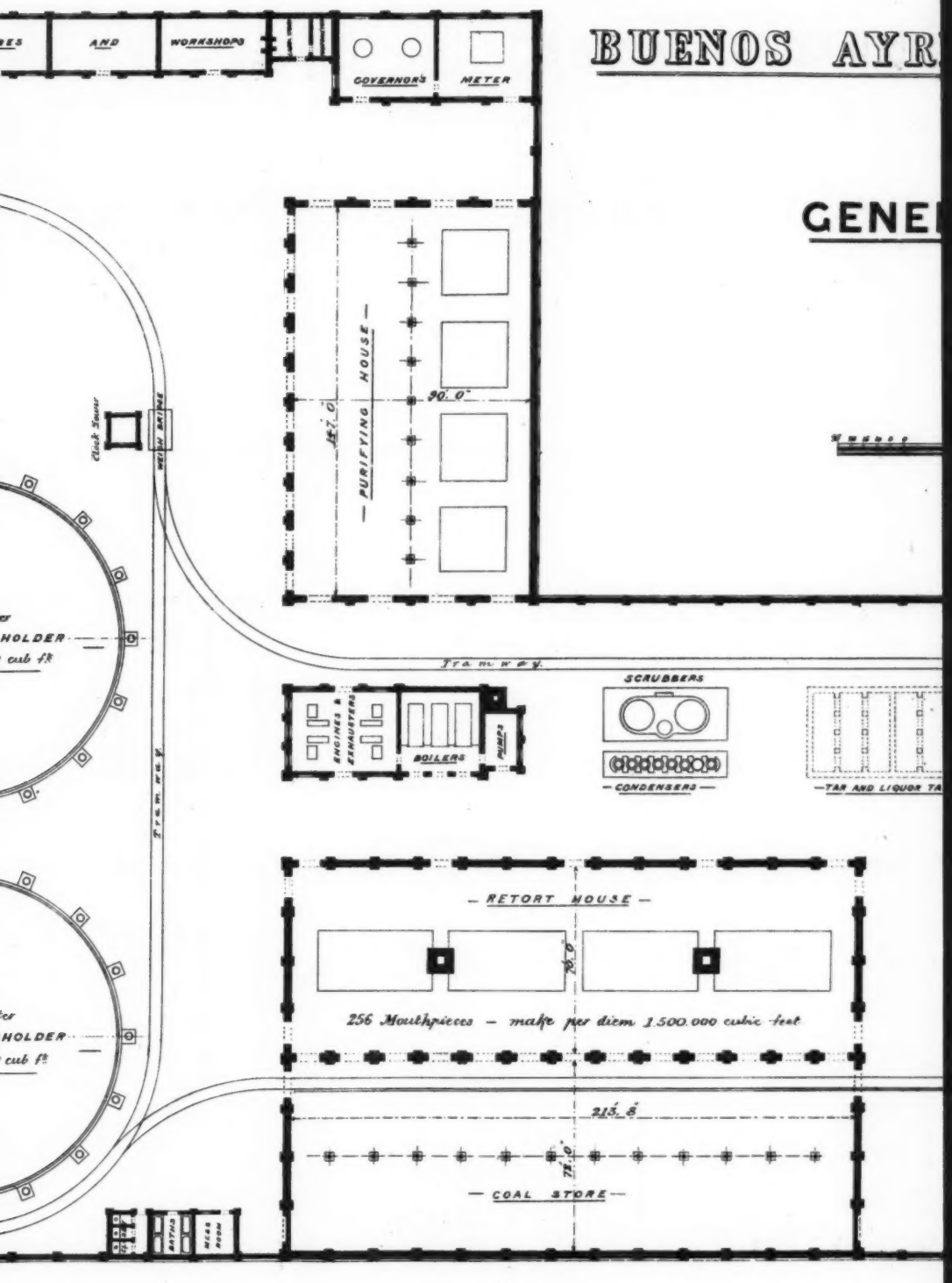
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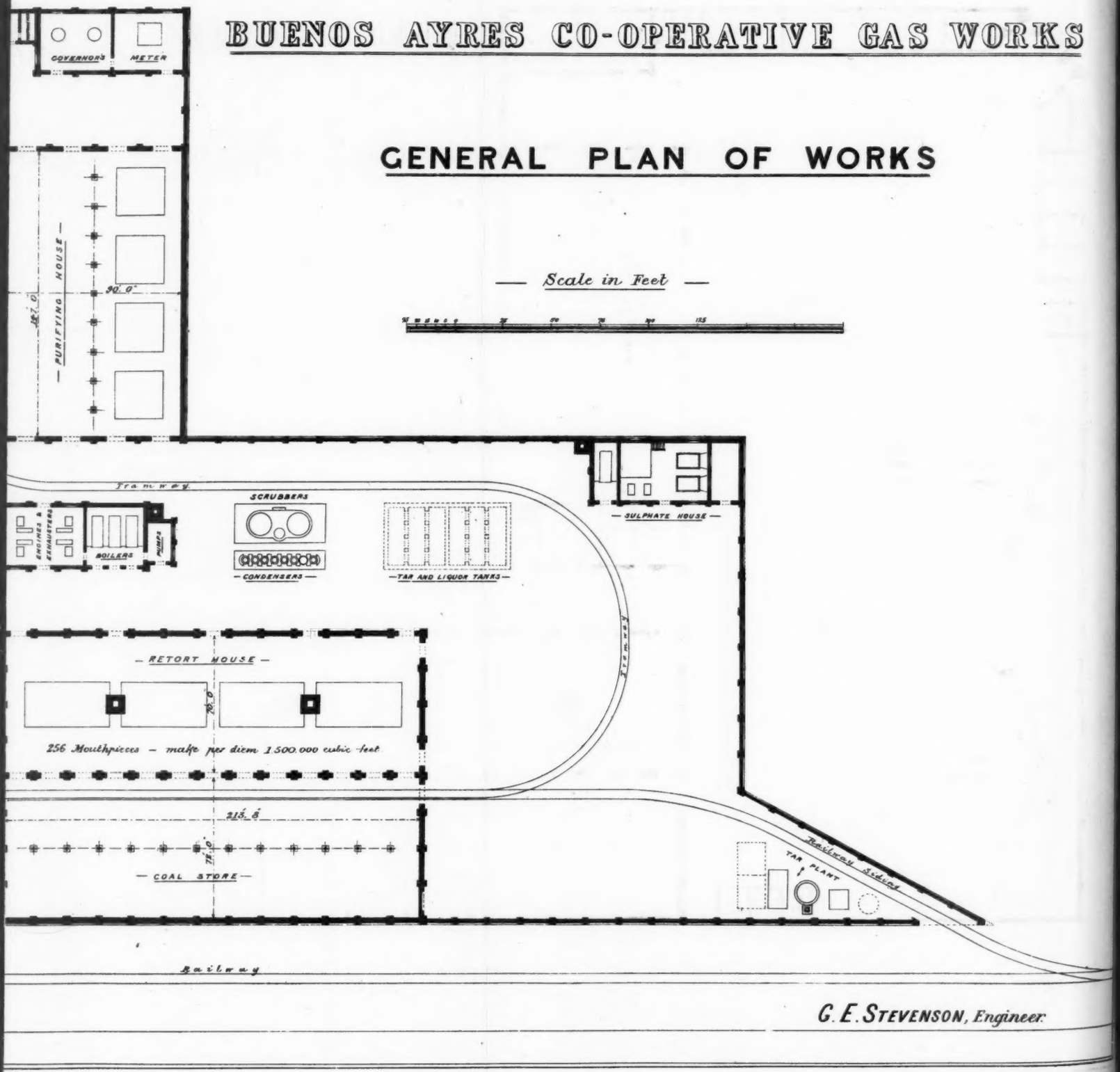
COAL STORE
Railway

BUENOS AYRES CO-OPERATIVE GAS WORKS

GENERAL PLAN OF WORKS

— Scale in Feet —



G. E. STEVENSON, Engineer.

anticlinal lines, in the arches of which the gas and oil are stored. Sometimes these areas are closed at one or both ends by the compactness and impermeability of the rock. The anticlinal structure seems to be of more importance with gas than with oil; the gas collecting in the crest of the arch. But complete anticlinals are not always formed; very often there is merely a lessening of the dip—the gas collecting on the terrace. In Eastern Ohio most of the gas and oil fields have this terrace-like structure. Kentucky and Tennessee are not of great importance as petroleum fields. In Colorado, borings have been made to a considerable depth at Florence, near Cañon city; the deepest was 3047 feet. The wells give a steady stream of oil, of from 20 to 100 barrels per day; the average being about 50 barrels. Some of the wells are said to increase in flow. There are oil springs in Western Colorado; but these have not yet been developed. The production in 1887 was 76,295 barrels; but in 1888 it was 297,612 barrels. In Wyoming, oil has long been known; but it is of low illuminating quality—the light-giving constituents averaging only 25 per cent. It is said that oil of a better quality, in some cases yielding 61 per cent. of illuminants, exists farther to the north-east. In California, petroleum is found chiefly in the Southern counties. High-pressure wells are rare—the oil being obtained by pumping. There is not much natural gas in California.

Turning next to Canada, Mr. Topley stated that the great part of the petroleum hitherto produced in the Dominion has been found in Lambton County, Ontario. It occurs along an anticlinal line; the webs being confined to a narrow belt of from 1 to 4 miles wide and about 20 miles long, running from north-east to south-west. The oil is here found in the Devonian rocks. It was first pumped about the year 1839. For the interval up to 1862 there are no statistics; but in that year the production was 11,775 barrels. The yield gradually rose to 575,000 barrels in 1879, declined to 250,000 barrels in 1883-1886, then suddenly rose to 868,345 barrels in 1887, and in 1888 again declined to 772,392 barrels. The average depth to the oil rock is nearly 500 feet. Few of the wells produce as much as 25 barrels of oil per day; the great majority pump only about a barrel. In the early days of the Ontario oil industry, the wells seem to have been much more productive. Either the general quality of Ontario petroleum has declined, or a higher standard has been required for refined oil. In 1881 the ratio of crude to refined oil was as 100 : 50; in 1887, it was as 100 : 38. Recent explorations in North-West Canada have shown the existence of important stores of petroleum and gas in various parts of that district. In the Devonian rocks along the Athabasca River, petroleum is met with in great quantity. It has also saturated the sandy beds of the cretaceous series. It occurs along the Vermilion River, and in numerous places along the Mackenzie River. It is known on Great Manitoulin Island, from the Trenton beds. It is found also in cretaceous rocks, near important seams of coal, at Crow's Nest Pass, in the Rocky Mountains. This is the only place yet known in British Columbia where petroleum occurs in any quantity; but bituminous matter oozes from the rocks on the Tar Islands, Queen Charlotte Islands. Gas issues from the Trenton limestone on the north side of the St. Lawrence, near Louisville and Three Rivers, and again at St. Leon, on the Ottawa River. It has been known from early days, and has been utilized to a trifling extent. Farther east, petroleum has been known in Gaspé; and it occurs in small quantities in Nova Scotia, Cape Breton Island, and on the west coast of Newfoundland. In all these places, however, the quantity of gas or petroleum is comparatively small; and Mr. Topley thinks the future production of Canada will, doubtless, come from the north-west territories.

Coming to Europe, Mr. Topley directed the attention of his audience to the important oil-producing district of the Caucasus; this part of his paper being illustrated by a series of photographs recently taken by Mr. Hume, F.G.S., and reproduced for use with a lantern. He remarked that, although petroleum occurs all along both flanks of the Caucasus, often in considerable amount, the Apscheron peninsula, on the western margin of which Baku is situated, surpasses all others in value. The most productive wells lie within a small area north-east of Baku, at Bálakhany, over the crown of a low anticlinal, which is probably the easterly continuation of the great Caucasus anticlinal. Another, but much less productive, area is on the shores of the Caspian Sea, at Bibi-Eibat, south of Baku, and about ten miles from Balakhany. Natural springs of petroleum, gas, salt water, and mud volcanoes have long been known here; and the Persian fire worshippers have from early times looked upon this as a sacred spot. The oil lies in various layers of sand, separated by clay, &c. This sand is often very loose, and comes up in great quantities when oil of high pressure is first tapped, flooding the country for some distance round. Enormous loss of oil often takes place when a high-pressure well is first driven. The Mining Company's well in August, 1887, when at a depth of 790 feet, struck oil, which flowed the full size of a 12-inch pipe for 69 days, 200 feet above the derrick. The lowest estimate for this well for the 69 days was 3,000,000 barrels, of which at least half was lost. During the month of March last, a new well threw up petroleum at the rate of more than 35,000 barrels per day, running to waste for several days. All such sudden influxes of oil lower the price. The last well is said to have caused a reduction of 30 per cent. The depth of the wells in the Baku area is gradually increasing. In 1882 the average depth was 350 feet; in 1886 it was 500 feet. Many are now upwards of 700 feet; and at least one is more than 1000 feet. The wells sometimes continue to produce for years, especially if they are sealed down when not required. The deeper wells, as a rule, produce the larger quantity, and often a better quality of oil, of lower specific gravity. Large numbers of wells, of from 200 to 600 feet deep, produce from 200 to 600 barrels per day. A few of greater depth, however, yield 1500 gallons or even more. The most important area of the Caucasus, after Baku, is that of Kouban, or Ilsky. This lies at the north-western end of the range. The wells here are usually of less depth, and are less productive than at Baku, although a certain well was bored to a depth of 1020 feet as far back as 1879; and in 1866, several thousand barrels of oil per day were given by one well for a considerable time. Here, as at Baku, the heaviest oil often comes from the higher beds. The third productive area is near Kertch, in the Crimea. The wells are not deep, and, compared with the two other districts, are not highly productive. One, however, has been carried to a depth of 940 feet, and for a time produced about 30 barrels of oil per day; its total production being about 3500 barrels. The total of the three areas, from 1884 to 1888, is as follows: 1884, 11,322,267 barrels; 1885, 14,630,352 barrels; 1886, 15,648,116 barrels; 1887, 16,665,527 barrels; 1888, 20,991,375 barrels. Around the Caucasus there are several other petroleum fields, which will rise in value when the highly productive district of Baku declines. Attempts have recently been made to work those near Batoum. There are comparatively few petroleum areas in the interior of Russia; and so long as the Caucasian fields are productive, there will be no great inducement to undertake expensive, and perhaps fruitless, exploration in new regions.

In Egypt, petroleum has been known to exist on the western border of the Red Sea from the earliest times; and in Algeria, petroleum springs were discovered about ten years ago in the eastern part of the province of Oran. Very little, however, has been done to explore the deposits. Petroleum occurs in Galicia; and in 1888 the production was 2,400,000 barrels. It is also known in Bosnia and in North-Eastern Hungary. In Bavaria, it occurs to the south of Munich, on the shores of the Tegernsee. The petroleum fields of North-West Germany are of some interest, as being those nearest to England, and also because they probably, to a great extent, represent the state of things to which we must look forward when the gushing wells and great petroleum "pools" are exhausted. At Oelheim, on the east of Hanover, there are a number of wells, often not more than 30 yards apart, all yielding small quantities of oil, with much salt water. Borings, some years back, discovered oil at Horst, a few miles east of Oelheim; and some wells are now in progress there. The petroleum of Hanover has been known for a long time. It escapes from the gault and other beds, to which it properly belongs, into the drift sands, and these appear at the surface. Petroleum springs are widely distributed along the northern flanks of the Apennines, from near Bobbio on the west to near Imola on the east. Petroleum has long been worked at Monte Gibbio. Gas, petroleum, and salt water issue in small mud volcanoes. The natural gas of Barigazzo has long been famous; but gas issues at many other points. In 1887, Italy produced 208 tons of petroleum and 18,507 tons of asphalte and bitumen. Petroleum occurs on the flanks of the Puy-de-la-Poix, east of Clermont. Borings recently made near the village of Lussat are said to have met with natural gas at a depth of 450 feet. Petroleum is also known near Gavian, in Herault. It occurs in numerous places along the northern flanks of the Pyrenees, in cretaceous and tertiary beds; and in the former beds in Catalonia.

With regard to the United Kingdom, so far as is yet known, petroleum and natural gas occur but sparingly; the latter, indeed, only in sufficient quantity to be a source of danger and annoyance in working mines. The gas of coal mines is but too well known; it occasionally comes off in "blowers" in considerable quantity; but these are fortunately soon exhausted. The gas is stored under pressure in fissures of the coal and associated strata; but it also occurs generally distributed throughout the pores and small interstices of some coal seams, and then is given off slowly in small quantities. Mr. Topley alluded to a suggestion recently made, that the gas of coal mines might be collected in pipes, and brought to the surface for use, as has been attempted in the United States. But he thought it was probably produced in too small quantity, and was too irregular in occurrence, to enable this to be profitably carried out. Gas found at the Wallsend Colliery burnt for several years; and a proposal was made to convey it in pipes to the Newcastle Gas-Works; but the yield declined. Gas occurs in the jet-rock of the upper lias in East Yorkshire, along with some heavy liquid bitumen. It sometimes finds its way down into the ironstone mines worked in the middle lias. Gas was found in the early borings for salt at Middlesbrough; and at the Seaton Carew boring some oil was obtained. In both cases the source was the upper beds of magnesian limestone, with which the salt deposits are associated, if present. Recently gas has been found in greater quantity and under considerable pressure in a boring which failed to find salt. An interesting discovery of petroleum, but only in small quantities, has recently been made at Bellagio, near East Grinstead, in Sussex. A boring there in search of coal is traversing the Wealden beds; and at from 512 to 521 feet, it passed through a bed of sandstone impregnated with petroleum. The associated Wealden shales are in places crowded with fossils. Petroleum occurs in the sandstone beds in the

coal measures of Shropshire. The mineral statistics of the United Kingdom give the following as the production of petroleum in Derbyshire: 1886, 43 tons; 1887, 66 tons; 1888, 35 tons; 1889, 30 tons; 1890, 35 tons. Contrasting these meagre indications of petroleum with the great stores of other countries, it may be asked why such small quantities have as yet been found in England, and whether the knowledge already gained in other areas will avail anything for prospecting for gas in this country. Our strata are for the most part as fossiliferous as those of petroleum-bearing regions. Why, then, have not the same processes of petroleum production taken place here? and why has such petroleum as may have been formed not been preserved? Mr. Topley suggests that our fossiliferous Palæozoic strata have been folded and denuded repeatedly, so that at various different ages their denuded edges have been exposed, and the gas or petroleum they may have contained has had every chance of escaping.

After dealing briefly with India, Burmah, Japan, China, and New Zealand, as petroleum producing countries, the author concluded by expressing the opinion that the great mineral oil districts of the world have seen their maximum development; and that as the use of petroleum is increasing, other and less favoured fields will be opened out. He considers we may look forward to a time—probably not far distant—when the high-pressure areas will be exhausted, and the supply of petroleum will come from less abundant but more permanent sources.

In an appendix to his paper, Mr. Topley gave some statistics (taken from the Customs returns) of the imports of petroleum into the United Kingdom from Russia, the United States, and other countries, for the years 1885 to 1888. They show the great development of the Russian trade in this illuminant, which in the four years named rose from 3,649,166 to 20,867,826 gallons, while that of the United States rose from 69,818,127 to 72,217,660 gallons only.

The Artesian Well in the City.—At the meeting of the Commissioners of Sewers on Tuesday last, the Engineer (Mr. W. Haywood, M. Inst. C.E.) reported that the boring at the artesian well in Aldgate had reached the chalk; the well being now 228 feet deep.

The New Purifying Arrangements at the Dukinfield Gas-Works.—At the annual meeting of the Dukinfield Local Board yesterday week, after considerable discussion, a recommendation of the Gas Committee was adopted to the effect that the Board accept the tender of Messrs. C. and W. Walker to supply new purifiers for £1200, and a roof to cover the Brin oxygen apparatus, for £775, and also the tender of Mr. J. Taylor (£458) for the erection of a new purifying-house.

Stafford Corporation Gas-Works.—Last Tuesday a special meeting of the Stafford Town Council was held to discuss a question connected with the proposal to make certain additions to the gas-works. The Local Government Board intimated in a letter that the borrowing powers of the Corporation were exhausted, and that in order to obtain an extension to cover the £15,000 sought for the alterations at the gas-works, a Provisional Order would have to be issued, and for this there was hardly time at this advanced period of the session. It being urgently necessary that the extensions should be completed, in order to meet the demand for gas next winter, the Council resolved to ask the Local Government Board to push the matter on as rapidly as possible. A petition to both Houses of Parliament was also authorized, praying that the Standing Orders might be suspended, so that the Order might pass in time.

The Water Supply of London and Birmingham.—Messrs. Hassard and Tyrell, MM. Inst. C.E., of Westminster, have addressed a letter to the *Birmingham Daily Post*, in the course of which they say: "We see that the Birmingham Corporation are now discussing the question of seeking powers in the next session of Parliament to appropriate the waters of the Rivers Elan and Claerwen for the supply of Birmingham, at a cost of £4,000,000. As these rivers are included as sources in our project for supplying London with pure water from Mid-Wales, and as your city can obtain equally pure water much nearer home, and at much less cost, we submit, in the interests of both cities, that the whole question should be reopened. No doubt a supply of pure water by gravitation for Birmingham is much to be desired. But the Metropolis is equally in want, with certainly equal claims; and we assert that from the Rivers Teme and Ithon districts, a daily supply of 55 million gallons of water can easily be procured for Birmingham, and that from these Welsh hills water enough is to be obtained, without clashing with each other's interests, both for the supply of the Metropolis and of the Midland city."

The Cambridge Gas Company's Assessment Arbitration.—The adjourned Court of Quarter Sessions for the Borough of Cambridge was held last Monday, before Dr. Cooper, the Deputy-Recorder, to hear an application on behalf of the Union Assessment Committee with reference to the Gas Company's appeal against the assessment of its property. Mr. Turner, for the respondents, asked that an order might be made for the award of the Arbitrator (*ante*, p. 411) to become the order of the Court, and said he must first ask whether the other side was willing to consent to have the costs taxed out of Sessions. Mr. Ellis, for the appellants, replied that he was not. Mr. Turner intimated that under these circumstances he should ask for the costs to be taxed in that Court. Mr. Ellis held that the Court had no jurisdiction to give costs, because the matter had been referred to an Arbitrator. The Deputy-Recorder thought, if the award was defective in the matter of costs, it might be sent back to the Arbitrator. Mr. Ellis said it could not be sent back without the consent of both parties; and he should not consent to it. The Deputy-Recorder did not think the case came within the meaning of the Arbitration Act at all; and he ordered that the award should be referred back to the Arbitrator for the purpose of ascertaining the costs.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by correspondents.*]

Walker's Over-Ground Gasholder-Tanks.

SIR,—Messrs. C. and W. Walker should feel very grateful to Mr. Cripps for taking up the cudgels on their behalf; for he first tells them that their patent has been anticipated, and then that the holders they propose to erect are dangerous structures!

Being an Englishman, it is a source of extreme satisfaction to learn that the idea of over-ground gasholder-tanks, with space underneath, originated in England; but the credit of erecting them is surely due to the German engineers, who, under the guidance of Professor Intze, built the first holders on this principle.

We all know the good old saying about an ounce of practice being worth a pound of theory; and although Mr. Cripps may have proved, to his complete and entire satisfaction, that gasholders on the Intze principle are theoretically unsafe, yet it is odd that the engineers and authorities in Berlin, Frankfort, Planem, Meissen, Brunswick, Gorlitz, and a number of other places, do not look upon the matter in the same light. To be exact, the Berlin Anhaltischen Engineering Company, Martinikinfelde, commenced the erection of the Intze holders in 1883—erecting the first one at Emmerich. In 1884, they erected three; in 1885, nine; in 1886, six; in 1887, thirteen; in 1888, six; in 1889, seven; in 1890, four—to say nothing of the holders on the same principle erected by Klönne and other engineering firms. All these holders, as far as I can gather, give satisfaction; and the excellence of the principle is fully recognized in Germany.

If our holder in Flensburg, constructed on the Intze principle, is (according to Mr. Cripps) erected on a dangerous system, then I have incurred a grave responsibility in advising our Directors to erect it.

In the interests of science, it is a pity that Mr. Cripps did not publish the article on the *disadvantages* of the system; but perhaps, after all, it is a case of "ignorance being bliss, 'twere folly to be wise."

F. D. MARSHALL.

Copenhagen, April 23, 1891.

Rack and Pinion Gearing for Gasholder Guidance.

SIR,—I observe under your "Register of Patents" in the last number of the JOURNAL, drawings and description of gasholder guiding arrangements patented by Mr. George Livesey, by means of racks and pinions.

It will perhaps interest you to learn that I submitted a similar design and description to Mr. Livesey eighteen months ago; and I have now put myself in communication with him. He replies that his plan of guiding gasholders has no resemblance to mine.

I, therefore, enclose the drawing sent to Mr. Livesey, and press-copy of the description, dated October, 1889; and I ask you to be kind enough to insert them in your JOURNAL, so as to allow your readers to judge for themselves, whether there is any resemblance between the two designs.

JAMES B. TERRACE.

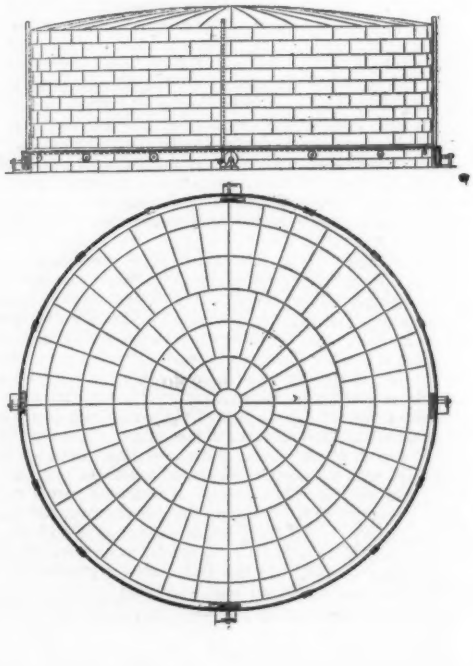
Brechin, N.B., April 22, 1891.

[ENCLOSURE.]

Description of J. B. Terrace's Double Rack and Pinion Gear for Gasholder Guiding, without Guide-Framing.

This arrangement consists of four or more short shafts, supported on bed plates fixed on the stone coping of the tank.

On each of these shafts, which project diametrical, are fixed two spur wheels, about 2 feet diameter. One is geared into the vertical rack fixed on the side of the holder (there being as many vertical racks placed at intervals as there are short shafts). The other spur wheel is geared into a horizontal rack made in the form of a ring, built in segments running round, and about 6 inches clear of the circumference of the holder, and so conveys the motion from one wheel to all the others; and, when any pressure attempts to raise one of the sides only, the vertical rack nearest the point of pressure turns the first described wheel, which in its movement turns the second

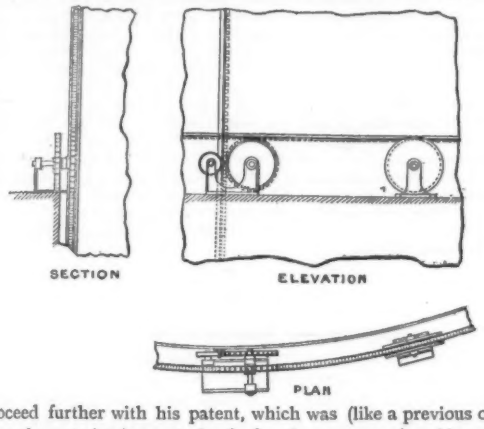


wheel under the circular rack, and thereby gives the motion to the other wheels and vertical racks all around the gasholder—preventing the usual oscillation, and securely holding the gasholder in a vertical position without the use of outside column guide-framing.

The circular rack is supported by the necessary guide-rollers fixed on the tank stone coping; and the vertical racks are provided with guide-rollers to keep the spur wheels in gear.

As the whole of this apparatus is above ground and close to the gasholder, it could easily be applied to telescopic gasholders.

[The engraving accompanying the foregoing description (showing the elevation and plan of the holder) has been prepared from Mr. Terrace's original drawing—reduced to one-third the size. It was dated Oct. 16, 1889. In response to a request for a larger-scale drawing of what he claimed for his own in this arrangement, Mr. Terrace on the 18th inst. forwarded the details given below, after he had seen Mr. Livesey's patent specification drawings. In connection with this matter, Mr. Livesey has authorized us to state that he never intended



to proceed further with his patent, which was (like a previous one of similar character) taken out simply for the purpose of making public some additional methods of guiding gasholders, and so preventing them from being monopolized as against himself or others. He has no desire to derive any private advantage whatever from this patent, which anybody is welcome to apply at discretion. Mr. Livesey declines to discuss the question of priority raised by Mr. Terrace, to whom the Patent Office was as open in 1889 as to anybody else.—ED. J.G.L.]

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following progress was made with Private Bills last week:—

Further Standing Orders complied with: Bognor Water Bill; Leighton Buzzard Gas Bill; Market Drayton Water Bill; Western Valleys (Mon.) Water Bill.

Opposition withdrawn: Kettering Gas Bill; Partick, Hillhead, and Maryhill Gas Bill.

Bills read a second time and committed: Bognor Water Bill; Dundee Water Bill; Leighton Buzzard Gas Bill; Market Drayton Water Bill; Sunderland and South Shields Water Bill.

Bills committed to a Select Committee, consisting of Earl Strafford (Chairman), Earl Kilmorey, Viscount Bangor, Lord Windsor, and Lord Sinclair; to meet on Tuesday, April 28: Alloa Water Bill, and Glasgow Corporation Bill.

Petitions against the following Bills were presented:—

Bognor Water Bill, from the Chichester Water Company, the Ecclesiastical Commissioners for England, the Duke of Richmond and Gordon, Rev. H. Clarke, and J. Addie.

Fylde Water Bill, from the County Council of the County Palatine of Lancaster and G. Singleton.

Garw and Ogmore Gas Bill, from Ogmore and Garw Local Board.

Rhyl Gas Bill, from the Rhyl Improvement Commissioners.

Sunderland and South Shields Water Bill, from Iron-masters and others in South Shields, Jarrow, Hebburn, and adjoining districts.

Western Valleys (Mon.) Water Bill, from the Blackwood and District Chamber of Trade, Monmouthshire County Council, Newport Union Rural Sanitary Authority, Guardians of the Poor of the Bedwellty Union, and owners and ratepayers in Argoed and Blackwood.

HOUSE OF COMMONS.

The following progress was made with Private Bills last week:—

Bill read the first time: Dundee Water Bill.

Bill read a second time and committed to the Committee on the London Water Commission Bill: Croydon Water Bill.

Bills reported: Barmouth Local Board Bill; Falmouth Water Bill; Filey Water and Gas Bill; and Stourbridge Gas Bill.

Petitions against the following Bills were presented:—

London County Council (Water Supply, &c.) Bill, from Chelsea and from the Lambeth and Southwark and Vauxhall Water Companies.

London Water Commission Bill, from the Central Middlesex Water Company, Limited, the Executive Committee of Vestries and District Boards of the Metropolis, and the West Kent Main Sewerage Board.

Metropolis Water Supply Bill, from Bexley, Brentford, Central Middlesex Water Company, Limited, Corporation of London, Essex County Council, Surrey County Council, and West Kent Sewerage Board.

LEGAL INTELLIGENCE.

NORTHERN DIVISIONAL POLICE COURT, DUBLIN.

Monday, April 13.

(*Before Dr.* KEYS, Q.C.)

Refusing to Supply Gas to a Public Lamp.

An action was heard to-day in which the Lord Mayor, Aldermen, and Burgesses of the City of Dublin summoned the Alliance and Consumers' Gas Company for having, on March 31 last and six following days, neglected and refused to supply gas to a public lamp situated near to Brady's Cottages, off Mayor Street, and within 50 yards from one of the gas-mains, as required by the complainants, whereby the Company had become liable to a penalty of 40s. for each default.

The Right Hon. S. WALKER, Q.C., and Mr. M. C. M'INERNEY appeared for the Corporation; Mr. KENNY, Q.C., for the Company.

Mr. WALKER, in opening the case, said that the Gas Company were obliged to supply gas to any public lamp within 50 yards from any of their mains. In this case the public lamp was erected some time ago. A correspondence ensued between the Corporation and the Company; and the latter insisted that the former should pay all the costs of the service-pipe and everything of the kind before they would supply the light. They were advised that no such obligation was cast upon the Corporation by the General Act; and that the Company were bound to light whatever public lamp was erected. In the section of the Act which dealt with the subject-matter of lighting for private occupiers, an obligation was placed on the Company, on an application from an owner or occupier within 25 yards of their mains, to give a supply of gas, and the cost of so much of the pipe as was laid for a greater distance than 30 feet from the main was to be defrayed by the owner or occupier. But there was no such obligation in respect of public lamps. In this case, a lamp had been erected at Brady's Cottages; but the Company refused to lay a main unless the Corporation paid for it.

Mr. KENNY agreed that the lamp was within 50 yards of a main; but he did not admit that it was a public lamp.

Mr. *T. J. Cotton*, Inspector of Public Lighting, deposed that the lamp at Brady's Cottages was erected by order of the Paving and Lighting Committee. He was informed that the street was under the charge of the Corporation.

Cross-examined: The lamp was erected six months ago; and it was not included in the plant taken over by the Corporation from the Gas Company under the recent award. The Corporation were to take over all the public lighting plant in use; and there were some lamps lying derelict that were not taken. They had never been willing to pay for the laying of service-pipes; but he admitted that after the Secretary of the Company stated that the Corporation would have to pay, he asked him what would be the expense of laying them. He did this in order that he might have the estimate to place before his Committee.

Mr. KENNY then read some correspondence which had passed between witness and the Secretary of the Company (Mr. W. F. Cotton). A letter was written by the former on Aug. 23 last asking the Company to lay a service-pipe for a lamp at Brady's Cottages; and mentioning at the same time that there was a pipe connected with the lamp laid to the entrance. To this Mr. W. F. Cotton replied that the Company did not supply gas through services which had been laid in the streets by other parties. Witness again requested the Company to lay the necessary pipes; but the Company stated that they would do so only if the Corporation agreed to pay the cost. Witness then requested to be furnished with an estimate of the cost; and Mr. W. F. Cotton wrote, on Sept. 23, that it would be £3 10s. Witness replied that the charge appeared rather high. Counsel added that from that date until the service of the formal notice (on the 25th ult.) to lay the ground for the summons, no further correspondence took place.

Witness, in reply to Mr. WALKER, stated that the lamp in question was put up by the Corporation; and therefore was not part of the plant taken over by them from the Company.

Mr. W. KENNY submitted that this was a most inconvenient way of testing a question which depended on the construction of a number of intricate Acts of Parliament. Some time ago in a similar case, Mr. O'Donel (one of the Magistrates) had complained of the attempt to cast upon him a duty which more properly belonged to the Superior Courts. That case had reference to the erection of a lamp in Abbey Street. The Magistrate allowed the case to stand over—the Gas Company undertaking to do one thing and the Corporation another for the purpose of raising the question by action before the higher courts. The Gas Company did what they agreed to do—viz., put up a lamp; but from that day to this, the Corporation had never taken any step to assert their right and raise the question. Counsel proceeded to contend that there had been no wilful refusal or neglect to supply the lamp at Brady's Cottages, because up to six months ago the Company had been left under the impression, from the correspondence, that the Corporation were willing to pay for the pipes, and there had been no further communication until a few days before the summons.

Judgment was deferred till Monday of last week, when

Dr. KEYS said there had been a suggestion that the place where the lamp in question was erected was not a public thoroughfare; but it was ridiculous to suppose that because it was a *cul de sac*, it was not therefore a public street. With regard to the contention concerning the making of a connection between the lamp and the street main, he considered it was the duty of the Company to supply the necessary fittings, and further he believed that, if the Corporation attempted to put in the fittings themselves, the Company would take proceedings against them for trespass. He held, therefore, that the Gas Company were liable; and he would make an order directing the Company to pay the penalties claimed in the summons.

MISCELLANEOUS NEWS.

METROPOLIS GAS SUPPLY.

Recent Appeals to the Chief Gas Examiner.

(*Continued from p. 752.*)

In the matter of the appeal of THE GASLIGHT AND COKE COMPANY *against the report of the Gas Examiner at the Spring Gardens testing-place, showing deficient illuminating power in the gas delivered by the Company on Dec.* 17, 1890.

The appeal was lodged within seven days after the day on which the report was made. At the hearing which I gave to the parties in this appeal, Mr. Trewby appeared for the Company; Mr. Dibdin for the County Council.

It appeared that the Gas Examiner duly delivered to the Company a report showing the results of his testings on the immediately preceding day. After doing so, he went over again the calculations which he had made in working out, from his various observations, the average illuminating power for the day. He found that he had made a slight error in the calculation. He then sent to the Company a second report, from which this error was eliminated. This second report showed the illuminating power of the gas to be such as to bring the Company within the limit of forfeiture; whereas the first report showed such illuminating power in the gas as would not render the Company liable to forfeiture. The Company contended that the second report ought not to be accepted, inasmuch as it was sent in after the time allowed by the Act for sending in such reports. It was admitted by the County Council that the second report was sent in after the statutory period.

I consider the second report is not valid, and cannot be accepted. Moreover, as the Gas Examiner has stated that there was an error in the calculations made for the first report, which, though slight, was sufficient to alter its effect, it appears to me that the first report ought to be cancelled, thus leaving no official record of the illuminating power of the gas on the 17th of December, 1890.

(Signed) ALEX. W. WILLIAMSON, Chief Gas Examiner.

March 11, 1891.

In the matter of the appeal of the SOUTH METROPOLITAN GAS COMPANY *against the report of the Gas Examiner at the Blackfriars Road testing-station, showing deficient illuminating power in the gas supplied by the Company on Nov.* 22, 1890.

The appeal was lodged within seven days after the day on which the report was made. At the hearing which I gave to the parties in this appeal, Mr. F. Livesey appeared for the Company; Mr. Dibdin for the County Council.

The Company stated that the gas sent out from their works on the day of the unfavourable testings was well above the statutory illuminating power; and they were unable to account for the low testings obtained by the Gas Examiner. An examination of the apparatus in the testing-room by one of the Gas Referees led that gentleman to observe a slight error in the cubic foot measure; its actual capacity being 997·75 oz. of water instead of 1000 oz. When allowance was made for this difference in calculating out the illuminating power of the gas, it was found that the deficiency of illuminating power was, by a very low decimal fraction, less than half a candle. It appeared, however, that there was also a small error in the thermometer; and the correction for this reduced the number representing the illuminating power of the gas so that the deficiency was a little more than half a candle.

It was urged by the Company that the mere fact of there being an error in the apparatus used in the testings should be held to invalidate them. No such thing is known as a perfectly accurate apparatus. The Gas Referees certify to the apparatus and fittings in a testing-place as being suitable for their purpose; yet from time to time they authorize or direct improvements or corrections to be made in the construction and use of the apparatus. Their certificate affords a legal and sufficient guarantee that such errors and defects as may belong to the apparatus are not so great as to prevent their being used for statutory testings.

I consider that the Gas Examiner's report of the illuminating power on the 22nd of November must be accepted.

(Signed) ALEX. W. WILLIAMSON, Chief Gas Examiner.

March 12, 1890.

THE RHYL TOWN COMMISSIONERS AND THE GAS COMPANY.

A Special Meeting of the Rhyl Town Commissioners was held last Tuesday, to consider "a suggestion by the Directors of the Gas Company, strictly without prejudice, to avoid further unnecessary expenditure, to insert a clause in the Gas Bill giving the Commissioners, subject to approval of the shareholders, the option of purchasing the gas-works by arbitration; the Arbitrator or Umpire, in determining the price to be paid by the Commissioners to the Company, to have regard to the fact that the Company is incorporated by Act of Parliament." The Clerk (Mr. A. Rowlands) stated that a meeting of the General Purposes Committee had been held on the night previous, at which letters were read from their Law Agent in London, and also the Company's Solicitor. It was resolved that he (the Clerk) be instructed to inform the Chairman of the Company that on the 6th inst. the Commissioners made an offer of £25,000 for the works, or as an alternative to abide by arbitration on the conditions laid down by the House of Commons Committee. The Directors were at the same time informed that the Commissioners were desirous to know whether or not the Company accepted the proposal by a certain date; and in the event of no reply, the Commissioners would oppose the Bill in the House of Lords with the object of securing a compulsory clause or getting it thrown out, as a petition had already been presented to the House of Lords on behalf of the Commissioners. If the Gas Company were desirous of making any further compromise, it would have to be done between the Agents in London. Their Agent was of the firm opinion that if the Commissioners fought the battle in the House of Lords the Committee would give what they asked, but would probably add the cost of the petition, which would not be more than £2000. The Commissioners must further bear in mind that, in addition to the cost of opposing the Bill, there would be the cost of arbitration, which they would have to pay; so that they could not afford to be too generous to the Company. Mr. Keatinge, in moving the confirmation of the minutes, said he wished to impress upon the minds of the Commissioners the necessity of supporting the recommendation of the Committee, that if they had any further dealings with the Gas Company it should be through their Agent and Counsel in London. Mr. Kent said he felt sure it was the unanimous feeling of the town that they should buy the gas-works; but it seemed to him that they were not being treated in a proper spirit by the Company. Mr. Greenhalgh thought that before the next ten years the electric light would become general in the principal towns throughout the country; and his opinion was that if they bought the gas-works it would throw them 20 years behind the times. The Chairman (Mr. W. Williams) said the question to his mind resolved itself into this—whether or not the Company were entitled to enhance the value of their works. They had got as they put it "one leg over the style;" and they expected to get the other, and, if they did, the Commissioners to a great extent would be at their mercy. He thought it would be best to try and compromise with the Company before going to the Lords, because he felt sure the Commissioners would not succeed in getting all they wanted. There was no denying the fact that Parliament respected vested interests, and that they would consider it from that point of view. After further discussion, the minutes were carried unanimously.

PARIS GAS COMPANY.

The Report and Accounts for the Year 1890.

The report of the Directors of the Paris Gas Company for the year ending Dec. 31 last, accompanied by the accounts for that period, was presented to the shareholders at their annual general meeting on the 26th ult. The following is an abstract translation of the report, with the accounts in condensed form.

Dealing first with consumption, the report states that in the past twelve months there were sent from the works 307,861,880 cubic metres, or about 10,867½ million cubic feet, of gas; being a decrease of 4,396,190 cubic metres, or about 155 million cubic feet, on the output in the preceding year. The difference is accounted for by the exceptional consumption which took place during the period of the Exhibition in 1889. The figures for last year are, however, higher by 10,164,060 cubic metres, or nearly 359 million cubic feet, than those for 1888; so that the average increase may be taken roughly at 180 million cubic feet per annum. The day consumption amounted to 80,522,325 cubic metres, or 26·15 per cent. of the entire bulk. This is a very great improvement, due to the largely increased use of gas for domestic and industrial purposes; as formerly the ratio of the day consumption to the total for the 24 hours rarely reached 15 per cent. The Directors look with confidence for further developments in this direction. The receipts from the sale of gas, which in the Exhibition year rose to 80,665,139 frs. (£3,226,606), dropped last year to 79,069,443 frs. (£3,162,778). Of this amount, 72,836,079 frs. came from the city, and 6,233,364 frs. from the surrounding districts. The number of consumers on the Company's books on Dec. 21 last was 233,010, or 8891 more than at the corresponding period of 1889. As in the latter year there was an increase of 11,604, the average for the two years is 10,247—very nearly double the average annual increase recorded since 1856. The number of public lamps in use at the end of the past year was 72,172, of which 62,071 were employed in the city and 10,101 in the outlying districts. The total was 3952, or 5·79 per cent., more than on Dec. 31, 1889. The employment, in the lighting of the public thoroughfares, of burners of the regenerative type is giving satisfactory results. At the date to which the report was made up, there were 1977 of these appliances in use in the streets, and 2355 by private consumers; making a total of 4332, or equal to about 33,300 burners of the ordinary pattern. What may almost be called a special feature of the Company's operations is the fixing of large service-pipes up buildings, for the supply of the various "flats." This work was pushed forward with the customary vigour last year; close upon 2200 services having been put in. At the end of the year there were no less than 30,230 of these rising pipes in use, distributed over 23,690 houses. The consumers of gas supplied in this way then numbered 110,496—being 7921 more than at the end of 1889, and nearly 50 per cent. of the whole of the consumers. Reference has been made in previous reports to the means adopted by the Company to increase the number of their customers. Rather more than three years ago they made special efforts to extend the use of gas for culinary purposes; and since then 106,987 cooking-stoves have been sent out. It is to the use of these appliances that must be attributed the increase in the consumption of gas which has taken place in the past two years. With regard to the works and plant, we find that no noteworthy additions were made last year to the manufacturing appliances, although some important main-laying operations were carried out in order to extend the distributing system from the stations at La Villette and Le Landy, and improve the means of supplying several outlying districts. The mains were increased to the extent of 30,444 metres, or 33,500 yards; bringing up the total length to 2,229,681 metres, or about 1384 miles.

Coming to the financial part of the report, we learn that the expenditure on capital account last year amounted to 6,559,529 frs. (£262,381), of which 2,118,826 frs. were spent on the new station at Le Landy, already mentioned; 2,507,699 frs. on house services, service-pipes, and

meters; and 754,912 frs. on canalization works. The capital accounts stood as follows on Dec. 31, 1890:—

	Francs.	Sterling.
Amount expended to Dec. 31, 1889 . .	276,090,053	£11,043,602
Do. Do. During 1890 . .	6,559,529	262,381
	282,649,582	£11,305,983
To meet which there has been raised—		
By shares . . . . . 84,000,000 frs.		
By bonds . . . . . 197,245,739 „		
	281,245,739	11,249,830
Showing an over-expenditure of . .	1,403,843	£56,153

The following is the working account for the past year:—

Expenditure.

	Francs.	Sterling.
Value of gas in store on Jan. 1, 1890 .	27,635	£1,105
Manufacture of gas—		
Coals carbonized	21,241,774	849,671
Coke and tar for heating purposes .	4,706,298	188,252
Salaries and wages	4,737,648	189,506
Maintenance of works and plant .	2,002,907	80,116
Incidental expenses of carbonization	1,742,490	69,700
Purifying materials	441,847	17,674
Distribution—		
Salaries of engineers and officers .	1,612,122	64,485
Repairs, &c., mains and services .	1,327,903	53,116
Miscellaneous expenses	323,323	12,933
General management—		
Directors and Executive Committee	300,000	12,000
Salaries	1,089,769	43,591
Office and other expenses. . . .	357,596	14,304
Service, accidents, &c.	335,826	13,433
Law and other charges	46,873	1,875
Bad debts	13,058	522
Rents and insurances	191,276	7,651
Interest on loans	8,347,925	333,917
Loan redemption fund	7,057,500	282,300
Share redemption fund.	2,376,500	95,060
Cost of experiments	86,906	3,476
Pension and provident funds . . .	265,725	10,629
Municipal charges—		
Tax of 2 c. per cub. met. of gas sold.	5,368,829	214,753
Rent of subsoil occupied by mains .	200,000	8,000
Lighting, extinguishing, and maintenance of public lamps (less amount paid by Municipality) . .	1,069,272	42,771
State charges—		
Official gas testing, stamps, &c. . .	1,091,162	43,647
Total expenditure	66,362,164	£2,654,487

Revenue.

	Francs.	Sterling.
Value of gas in store on Dec. 31, 1890	52,210	£2,088
Sale of gas	79,069,443	3,162,779
Residual products—		
Coke	15,751,886	630,075
Tar.	2,520,849	100,834
Ammoniacal liquor	1,369,322	54,773
Rental of meters and fittings. . . .	3,274,184	130,967
Fire-bricks, &c.	171,863	6,875
Interest and discount	1,082,030	43,281
Miscellaneous	85,310	3,412
Total revenue	103,377,097	£4,135,084
Deduct expenditure	66,362,164	2,654,487
Balance, profit for 1890. . .	37,014,933	£1,480,597
Deduct to meet outstanding claims. .	314,933	12,597
Balance available for distribution . .	36,700,000	£1,468,000
Deduct for share dividend	11,200,000	448,000
Balance, divisible equally between the Company and the Municipality . .	25,500,000	£1,020,000

The total amount available for distribution among the shareholders is therefore as follows:—

	Francs.	Sterling.
Dividend as above	11,200,000	£448,000
Half of divisible balance	12,750,000	510,000
Portion of annuity (now compounded) payable by Municipality	50,000	2,000
Balance of undivided profits . . .	214,002	8,560
Total	24,214,002	£968,560
Deduct 1 fr. per share for reserve fund.	336,000	13,440
Balance	23,878,002	£955,120
Deduct interim dividend of 12 frs. 50 c. per share paid in October last . .	2,811,037	112,441
Balance available for final dividend .	21,066,965	£842,679

The balance allowed of a further payment of 62 frs. 50 c.—making 75 frs. per share of 250 frs., or at the rate of 30 per cent., leaving 66,964 frs. (£2638) to be carried forward.

With regard to residuals, less coke was produced last year than in 1889; but more was sold. The difference was, of course, taken from the stock in hand, which was brought down to 5,693,000 bushels at the close of the year, or about 3,606,000 bushels less than at the corresponding period in 1889. The treatment of the tar and ammoniacal liquor produced better results by 10 per cent. than in the previous year; and then they were 6 per cent. higher than in 1888. The number of heating-stoves burning coke which were sold last year was 1318; exceeding by 282 the number disposed of in 1889. There are now rather more than 66,000 of these appliances, all sent out of the Company's workshops, in use, mostly in Paris.

Particulars are, as usual, given as to the position of the reserve, provident, and other funds; and then we come to an announcement by the Directors of their intention to issue 500,000 additional bonds, of 500 frs. each, redeemable in the 15 years which the present concession has to run—viz., till 1905. The reason for this step is fully explained. It has been already shown that the capital account has been overdrawn to the extent of 1,403,843 frs. Then works have been carried out, and others are in course of execution, which will cost something like 667,000 frs.; and the Directors purpose, between now and 1894, raising the productive capacity of the stations from 308 to 331 million cubic metres, at an estimated expense of 4,000,000 frs. For outdoor works 15,600,000 frs. will be needed; together with 2,400,000 frs. for additional land. So that, with unforeseen expenses, the 25,000,000 frs. about to be raised will be pretty well swallowed up.

The report concludes with a short reference to the Quinquennial Commission nominated at the beginning of last year by the Minister of the Interior to investigate the subject of gas manufacture. A sketch of the work of the Commission, it may be remembered, was given in the JOURNAL for Jan. 20 last (p. 107). In regard to the conclusion come to, that the commercial element preponderates very greatly over the technical in affecting the net price of gas, the Directors point out that this confirms in a remarkable degree the conclusions arrived at by the Commissions of 1880 and 1885. They prove, it is stated, that the Company's systems of manufacture are in no respect inferior to those in use in the provinces and abroad, and justify the prudence the Directors have always displayed in adopting only those improvements which have been sanctioned by experience, and which constitute real progress in the important operations in which they are engaged.

GAS EXHIBITS AT THE IRONMONGERS' EXHIBITION.

The Engineers' and Ironmongers' Exhibition, which opened at the Agricultural Hall last Thursday, might have been justly called the "Gas Engineers' Exhibition." As a matter of fact, gas-engines are almost alone in the engine department, where in previous years, motors of all descriptions have been found. The only steam-engine manufacturers who have entered the lists are Messrs. Hindley, of Queen Victoria Street, who show various sizes of vertical and horizontal engines; while against this one firm are arrayed no less than 18 gas-engines, the products of eight manufacturers. The most attractive stand is that of Messrs. J. E. H. Andrews and Co., of 80, Queen Victoria Street, who exhibit four "Stockport" gas-engines, ranging from 1 to 4 horse power. All these are fitted with a patent non-corroding tube ignition; and the engines are running with a speed and noiselessness that greatly commend them. The adjoining exhibits of the Campbell Gas-Engine Company, of Halifax, comprising a 6-horse, a 2-horse, and a ½-horse horizontal engine, are exceedingly attractive, especially as they are of the new type recently introduced. The little ½-horse engine is a very pretty piece of mechanism, and is greatly admired. Messrs. Crossley Bros., Limited, of 10, St. Bride Street, show two "Otto" engines fitted with the latest improvements. Mr. F. R. Woodhead, of Leeds, exhibits one of his 3-horse power horizontal engines, known as the "Leeds" Otto gas-engine, which cycle of operations is now being universally adopted; but one remarkable fact about the mode of ignition employed in this engine is that it is the same as the engine shown in the Hall ten years ago—the first engine which ran successfully with the tube ignition in London. It is claimed that this engine is one of the simplest engines extant, and very economical in its consumption of gas. He also shows a 1-horse power vertical engine which requires very little floor-space, and probably has a smaller number of working parts than any engine made. The Trent Gas-Engine Company, of New Basford, Nottingham, have two very fine engines at work—one large, of 9-horse power, and the other of 6-horse power. Two new gas-engines, so far as public exhibits are concerned, are the "Colne," by the Colne Engineering Company, of Twickenham, and the "Bradford," by Messrs. S. Clayton and Co., of Tunbridge Road, Bradford. The former engine is of vertical construction, and is very prim in appearance. The mechanism is simple—there being no slide-valves or intricacies; while the greatest advantage is that it is about half the ordinary cost. As to the "Bradford" motor, it is the first gas-engine in which tube ignition has been successfully applied; and it also has a mechanical igniter. There are no firing slides and no stuffing-boxes; and it is claimed that a smaller consumption of gas is required by it than by any engine in the market.

Leaving motive power, we turn to lighting and heating. The two best stalls in the exhibition are those of Messrs. D. Hulett and Co., Limited, of High Holborn, and Messrs. H. Darwin and Co., Limited, of Glasgow. That of the first-named firm comprises all kinds of lamps for public and private use. Very special prominence is given to their gas-governor and prepayment gas-meter, which is adapted for workmen's dwellings, small consumers, &c. Some fine samples of outside lamps and brackets are also shown to advantage. As to the stand of Messrs. Darwin, a much better assortment of stoves than they have could scarcely have been exhibited. Altogether, there are some 40 cookers, and the same number of heating-stoves; the latter being arranged with or without overmantels, in a very homely way. It should be added that Messrs. Darwin have fitted up a room for cookery demonstrations; and Mrs. Helen David does her best in this department till the end of the week. Messrs. H. Greene and Sons make a splendid show with their renowned "Meteor" gas-lamp and their "storm-proof" outside lamp. The effect of this stall at night is indeed brilliant. We noticed that the old firm of Messrs. Carnaby, of Broad Street, Bloomsbury, have taken to exhibiting their well-known safety gas-regulator; their stall was well patronized. There are in the ranks several opponents to ordinary coal gas, such as the Sunlight Oil-Lamp Company, and the "Cold Process" Gas Supply Syndicate. By the aid of Welsbach mantles, the latter Company were able with their gas to light up fairly successfully the band stand of the exhibition.

Rhyl Water Company.—The gross water-rental of this Company for the year ending Dec. 31 last amounted to £3569; and the net earnings to £2693. At the annual meeting last Tuesday, dividends at the rate of 5 and 6 per cent. were declared respectively on the two classes of shares.

ELECTRIC LIGHTING IN BIRMINGHAM.

The works of the Birmingham Electric Supply Company were formally "opened" last Wednesday by the Mayor of Birmingham (Mr. Alderman F. C. Clayton). It may be remembered that in 1888 the City Council granted a concession to Messrs. Chamberlain and Hookham for an experimental public supply of electricity within a defined area of the city; and this concession was in 1889 transferred (with the assent of the Corporation) to a Company, of which Mr. H. Buckley is Chairman, and Mr. J. C. Vaudrey, Managing Director and Engineer. The area first defined was subsequently varied; and it now includes most of the important shop and office thoroughfares and many large commercial houses in the city. The works are situated in Dale End; and there the Company have already laid down plant capable of supplying 4500 16-candle power lamps. The buildings cover sufficient area to permit of very considerable extension of the plant; and the Company have already undertaken to add to it so as to increase the productive capacity to 10,500 lamps. The supply in Birmingham commences with orders for 2367 lamps. The underground mains have a total frontage to property of 6160 yards; and in laying these, copper strip to the length of 42,000 yards and the weight of 100 tons has been used. The generating room at the works measures 77 ft. by 28 ft., and at present contains three compound (Willans') engines and dynamos. There is accommodation for four other engines and dynamos. The engines run at 350 revolutions per minute, and work up to a pressure of 120 lbs. Each dynamo will supply 1500 of the 16-candle incandescent lamps. The boiler-house, measures 77 ft. by 41 ft., and at present contains three steel-flued Lancashire boilers, each 28 feet long and 7 ft. 6 in. diameter, fitted with Procter's mechanical stokers. There is room for another set of three boilers. The nominal capital of the Company is £100,000, of which 10,000 £5 shares are paid up; and of the further £50,000 required to develop the undertaking as the demand increases, 1800 £5 shares have already been taken up. The charge for the light is to be 8d. per unit. At the inauguration on Wednesday, the Mayor expressed the pleasure he experienced in his official capacity in the opportunity of showing the goodwill of the Corporation towards the newest Birmingham venture. The position of the Corporation, as the undertakers of the gas supply of the city, might, he said, have exposed them under some circumstances to invidious remarks as to their opposition; but they had not adopted any sort of dog-in-the-manger policy. They had been anxious to afford every reasonable facility in their power for the supply of electricity to the town; and nobody could say that they had used their position to hinder the undertaking in any way. He hoped the Company would prove to be a sound commercial investment, and that if it so turned out, the Directors would show their public spirit by immediately reducing the price charged to consumers. They had indeed already shown their anxiety to benefit the public in the matter of cost, for although the Board of Trade fixed the maximum price at 10d. per unit, the Directors had voluntarily, and before they had any knowledge as to how the experiment would turn out, reduced it to 8d. per unit. Even in the presence of the Chairman of the Gas Committee (Alderman Pollack) he would say that he welcomed a competitor to the gas supply, because he was prepared to admit that the quality of their gas was not absolutely perfect; and he had no doubt the two concerns would act and react on each other for the benefit of the public. The new Company would put the Gas Department on their mettle, and that, in its turn, would put the Company on theirs; and thus the two concerns would work hand-in-hand for the benefit of the town. He had had an opportunity of inspecting the works several times during their construction; and he considered the arrangements were such as would give unqualified satisfaction. The undertaking was in the hands of Mr. Vaudrey and other gentlemen who put up the electric light works (which had proved so successful) at Liverpool; and he had no doubt that the success of Liverpool would be repeated in the case of Birmingham. He believed the Corporation were really the first customers of the Company in deciding that the Victoria Courts should be lighted by electricity. He had the greatest pleasure in formally declaring the works open. At the request of the Mayor, Mr. Vaudrey afterwards gave an explanation as to the safety of the system on which the light will be supplied. He said the current would be of absolutely low pressure—110 volts; whereas in the accidents which had occurred in America, the system was high pressure, of 2000 volts. The latter pressure was high enough to kill anybody; but the difference between 2000 volts and 110 volts was very great. The latter was so low that anyone could place his hands on both sides of the terminals and the shock would not be more severe than that of an ordinary medical battery. With regard to the security against fire, all he could say was that the whole of the work of installation had been done under the Fire Insurance rules; and experience had shown that under these rules they were perfectly free from fire risks. A dynamo was subsequently set in motion, and the regular supply of electricity as an illuminant inaugurated.

THE ELECTRIC LIGHT UNDERTAKINGS OF MASSACHUSETTS.

In the JOURNAL last week we gave some statistics in reference to the gas undertakings of Massachusetts, extracted from the last report of the Gas and Electric Light Commissioners of that State. From the same document we take the following particulars in regard to the business of electric lighting.

On June 30 last the number of companies supplying the electric light in Massachusetts was 83; the capital employed by them ranging from $1,160,000 down to $4000. Of course, Boston stands at the head for the extent of lighting; the Boston Electric Light Company having $1,000,000, and the Edison Company $1,160,000 sunk in the business. Next in importance comes Springhill, where the United Electric Light Company, with a capital of $300,000, are working; then we have the Worcester Company, with $200,000; the Lowell Company, with $197,700; the Edison Company of New Bedford, with $150,000; the Salem Company, with $140,000; the Woburn and Somerville Companies, each with $120,000; the Malden Company, with $100,000. The rest have smaller capitals. It may be of interest to show how much of this money has been spent on works; and for this purpose we take the value of the plant of each of the companies named, as assessed by the local authorities. That of the Boston Edison Company is not given; but the other company supplying the city have spent $525,200; the United Company of Springfield, $195,000; the Worcester, $167,000; the Lowell, $72,400; the Salem, $163,000; the Woburn, $47,000; the Somerville, $49,900; and the Malden, $100,000. The result of the working of all the companies in the twelve months ending at the above-named date was: Receipts for light and power, $1,908,394; from other sources, $12,308—total, $1,920,702. Expenses: Manufacture, $752,831; distribution, $281,046; offices expenses and management, $116,351; taxes, $67,621; miscellaneous, $122,965—total, $1,340,814. The balance was therefore $579,887. These figures include, of course, the earnings of the electric lighting departments of gas companies, amounting to $110,871. Taking this sum away from the above balance, the remainder—$469,016—represents the earnings of the electric lighting companies, and therefore applicable to the payment of interest and dividends. The latter amounted last year to $154,708; the rates ranging from 10 per cent. at Pittsfield, on $10,000 sunk in plant, down to 1½ per cent. at Woburn. The Malden and Fall River Companies each paid 8 per cent.; the Taunton Company, 7 per cent.; the Boston, New Bedford, and Springfield Companies, each 6 per cent.

Of the various systems of lighting, the Thomson-Houston is by far the most generally employed. At the close of the year covered by the report, there were in use 140,870 lamps of 16-candle power, as compared with 80,075 and 52,075 lamps at the corresponding periods of the two previous years. In 20-candle lamps there was a drop from 2800 to 1700; but in 1200-candle lamps a rise from 4206 to 6085 is recorded, and in 2000-candle a rise from 6978 to 8425. Full particulars are given of the number and power of arc and incandescent lights used for commercial purposes, and the number of customers for each kind; also of the public lamps, the hours per night and nights per month during which they burn, and the price paid for them. It is difficult to summarize these statistics. In some cases the lamps burn all night throughout the month; in others, only for certain specified hours with a "moon" schedule; others, again, only on dark nights. The prices paid for this class of lighting as well as by the private consumers are all set out in great detail in the report; but it will perhaps be sufficient for the present abstract to give the figures for the public lighting—the charges for the private lighting being very complicated—in the case of a few of the larger companies already dealt with. Beginning with the Boston, there are 774 lamps of 2000-candle, and 622 of 16-candle power, with a few others, and they burn all night right through the month; the price for the high-power lights being 40c. per night, and the average for the smaller ones 10c. each. At Springfield there are 360 lamps of 1200-candle power which burn all night through the month for 23c. per lamp per night. At Worcester similar conditions prevail; the 2000-candle power lamps being paid for at 45c. each per night, and the 65-candle lamps at $1.50 per month. At Lowell the figure for 200-candle lamps is 50c. per night; and at New Bedford, 40c., with a moon schedule and the lamps used on dark nights as may be ordered. At Woburn, the lighting is from dark till 12.30 a.m. on 22 nights; and the price is $541·66 per month for 40 1200-candle, and 240 25-candle lamps. At Somerville there is a three-years contract for $20,000 per annum for all the lights, which comprise 140 2000-candle, and 275 25-candle lamps; the former burning from sunset to 1 a.m. every night, and the latter for the same period for 22 nights per month. At Malden a moon schedule is in force, and for the 74 1200-candle lights in use the price paid is $90 per annum; for the 1000 25-candle lights, $18 per annum.

New Joint-Stock Companies.—The following new joint-stock companies have lately been registered: Berkeley Gas-Works, Limited, with a capital of £4000 in £1 shares, to carry on gas-works at Berkeley, Gloucestershire, in accordance with an agreement entered into between Joseph Moffatt and various other members of the family. Johnson, Matthey, and Co., Limited, with a capital of £900,000, in £15 shares, to acquire the business of Messrs. Johnson, Matthey, and Co., the well-known assayers, metallurgical chemists, and dealers in metals and chemicals. R. Button and Co., Limited, with a capital of £2500, in £1 shares, to acquire the business of Messrs. H. Button and Co., of Rainham, Essex, and carry on generally the trade of manufacturing chemists. The Red Oxide Syndicate, Limited, with a capital of £15,000, in £5 shares, to carry on the business of manufacturers of red oxide, oxide of iron, &c., and to acquire certain patents relating thereto. The Lancashire Sewage Purification Company, Limited, with a capital of £3000, in £1 shares, to carry on the business of the purification of sewage and manufacturers' waste waters.

Proposed Electric Lighting at Hackney.—Another unsuccessful attempt (the twelfth recently) to introduce the electric light in Hackney, Stoke Newington, Kingsland, and Upper Clapton, has just been made. The members of the Hackney Board of Works spent nearly two hours last Wednesday evening in discussing an application from the Laing, Wharton, and Down Construction Syndicate, for permission to provide electric lighting for the main thoroughfares in the district. The Syndicate said they were willing to enter into an agreement with the Board to deposit with them, within one month after confirmation by Parliament of the Provisional Order, £1000 as a guarantee of their *bona fides* to carry out the work, or transfer the power to do so to some company, before the expiration of two years and four months, after which period the guarantee sum was to be repaid without interest. In the discussion which followed, a good deal of opposition was expressed to the scheme; a strong objection being the granting of a monopoly to the Syndicate. One speaker stated that it was calculated by competent authorities that the electric light cost double the present price of gas; and another protested against the project on the grounds that electric currents are a great danger to life and property. In the result, the Board decided, by a majority of 22, not to accede to the application.

THE NEW WATER SUPPLY SCHEME FOR BIRMINGHAM.

The Report of the Water Committee Approved.

The debate on the report of the Water Committee on the new water-supply scheme for Birmingham was resumed at the Meeting of the City Council last Tuesday—the MAYOR (Mr. Alderman Clayton) presiding. A summary of the report and of the discussion which took place when it was before the Council three weeks ago, appeared in the JOURNAL on the 14th inst.

Mr. JACOBS, on whose proposition the debate was adjourned a fortnight ago, criticized the scheme of the Water Committee in a lengthy speech. He said that a very serious responsibility rested upon the members of the Council; for if they voted for the measure which was proposed to them by the Water Committee, they would entail upon the town for generations to come an enormous debt—a debt which perhaps they would have great difficulty in paying off. On the other hand, they were told that they were in danger in the near future of incurring a water famine. The question occurred whether, before involving themselves in so enormous a debt, it would not be wise to ask the Committee to reconsider the subject, and to see if they could not get water from some other and nearer source than the one proposed to them. Sir Thomas Martineau told them that Mr. Mansergh would not bind himself to any figure, or say whether the cost of the scheme would be four millions or more. It might be an expenditure of four, five, or six millions of money that they would practically be voting for or against on the present occasion. Could they not get other engineers as eminent as Sir R. Rawlinson and Mr. Mansergh to advise the Council on some other way of procuring water. It was pointed out that if Birmingham went on increasing as it had done, in 1920 they would be short of water. How could they be certain that the previous rate of increase would continue; and, if it did, why should they not let Handsworth, and Aston, and other large and thriving suburbs take their water from the South Staffordshire Water Company? These districts contributed nothing towards the rates of Birmingham, and would take the responsibility of no share of the debt. They were also told that they must not delay acquiring rights over the Elan and Claerwen, because if they did the London County Council would do so. He thought the latter would think twice upon the subject, and would not rush at it so madly as appeared to be suggested. At the same time, he would point out that it was a different thing for London to embark upon such a scheme to Birmingham undertaking it. In the case of Birmingham, the capital expenditure would be equal to £14 per head of the population; but if London were to do it, the amount would only be about £1 per head. With regard to the increase of water-rentals, he would point out that the charges in Birmingham were already more than 1s. in the pound higher than in most first-class towns; while the rates were nearly double.

Alderman HART said it was one of the great glories of the Corporation Water Department that their work had been carried on without any charge upon the rates; and he believed this would continue to be the case. Mr. Jacobs had not attacked the scheme in the way he (Alderman Hart) expected, upon what he admitted was its weakest point—namely, the calculation that the increase of population and demand would continue in the same ratio as hitherto. He admitted that this was problematical; but the Committee had done the only thing they could do—they had looked back into the past. During the time the Corporation had had control of the Water Department, the annual rate of increase had been between 4 and 5 per cent.; and in taking 5 per cent. as the basis of their forecast of the future, he thought they had adopted a very reasonable figure. He assured the Council that the Committee had not arrived at their recommendation in any hasty manner, but had taken the very highest advice that could be obtained.

Alderman BAKER inquired whether, in raising the rentals by £24,000 a year, care would be taken not to restore the inequalities which were removed when the water-rental was reduced. Another matter calling for attention was the position of the water consumers outside the city. It seemed to be unfair that the city, with its rather limited area, and surrounded by large bodies of people who took all the advantages of Birmingham without giving anything in return, should bear the responsibilities of the undertaking, while those outside bodies escaped any responsibility in the matter. He understood Birmingham was bound to supply these outside populations with the water at the same rate as the city was supplied; but he hoped the Committee would find some way of meeting that difficulty.

Mr. BRADLEY said the members of the Council must all agree that the supply of water to the town was of paramount importance; and with him the question of cost was of secondary consideration as compared with the question of whether the Council were asked to proceed on right lines. He was not aware until recently that they were in a dangerous position in regard to the water supply; and he should like to know on what information the Committee came to the conclusion that the city was in such peril, and also whether there had been any alternative scheme considered. He further asked whether the suggested saving of £20,000 a year on pumping meant that the present source of supply was to be abandoned, or that the new supply would be obtained at a relative cost of £20,000 a year less.

Mr. BARCLAY, contrasting the Welsh scheme with the proposal to supplement the present supply from local sources, said that, while the latter would ultimately involve a perpetual charge of £64,000 a year for pumping, the Welsh scheme, if adopted, would mean that 18 years hence there would be a surplus shown of £8000 a year, at which time the water-rents could be reduced, or the capital paid off more rapidly than at 60 years; and under any circumstances, the capital would be paid off at the end of the 60 years.

Alderman AVERY said that he regarded with great apprehension the expenditure of so large a sum of money; but he was convinced that the Committee had made out a case of the strongest character, showing the prudence, the wisdom, and the necessity of the outlay. Mr. Jacobs had objected that the Water Committee's calculations were based on the theory of a continual advancement of the city; but that was just what they ought to be, as it would continue to advance. The Corporation had not made a bad bargain in buying the present water-works; for although the investment had contributed nothing in aid of the rates it had reduced the price of a necessary of life by £35,000 a year.

Mr. PARKER declared his opinion that the scheme was the best which could be submitted, and that they had no time to lose in putting it into effect. It was doubtful if a better watershed than that of the Elan and Claerwen could be found in England. Someone had asked whether they were justified in thinking that the rate of growth in Birmingham would be constant; but he thought the true question was whether they were justified in taking any other basis of calculation. In favour of this particular scheme, they had the opinion not only of Sir Robert Rawlinson, Mr. Mansergh, and Mr. Gray, but of two other engineers, who had strongly recommended the watershed to their particular authorities.

The MAYOR said he thought the Council were much more likely to be guided by the opinion of their own engineers than by that of engineers who stated very frankly that they were engaged by other people with interests opposed to those of Birmingham. The Council had not, to his mind, given sufficient attention to the economic phase of the problem. There seemed to be little doubt that the saving from the use of soft water in the city would more than repay the £24,000 a year by which it was proposed to increase the water-rents.

Alderman Sir THOMAS MARTINEAU, in replying on the discussion, said there had been a very general acceptance of the scheme, and a total absence of any comprehensive opposition to it on its broad merits. Mr. Jacobs thought they could meet the requirements of the inhabitants by enlarging their system of deep wells. But it was because the deep wells had been failing that Liverpool had been obliged to go to Vyrnwy; and they had an illustration of the failure of the well system only the other day at the Birmingham Workhouse. As to other sources, Messrs. Hassard and Tyrrell had written a letter to the newspapers in regard to the River Teme. Twenty years ago Mr. Hassard brought forward a scheme for taking water from the Teme. He was not asked to do so by the Town Council; but knowing that they were considering the subject, he propounded his scheme, which was reported upon by Sir Robert Rawlinson in the following year, at the request of the Council. Sir Robert rejected the Teme scheme, because he thought the Elan and Claerwen district was better, and that district was the one which was preferred now because those rivers were superior, and would yield a larger and purer supply of water. No doubt, Messrs. Hassard and Tyrrell would have liked the Council to fall in with their scheme and go to the Teme, because they had, unasked, recommended London to take a large number of river areas in Wales, including the Elan and Claerwen, and they did not wish Birmingham to interfere with their project. However, the Committee had a scheme which they had fully thought out; and they told Messrs. Hassard and Tyrrell that, if they were so fond of the Teme and Ithon, they could have them for London. The Committee now asked to be allowed to again put on the water-rental what they were able to take off in 1881 and 1884. They were now receiving something over £13,000 a year under the water-rental; and they proposed to put on an additional £24,000, which was less than one-fifth of the total amount that they received. With regard to the works, the two pipes which would be laid down, and which would be necessary, would give them a supply of from 20 to 23 million gallons a day; and this, they believed, would be enough to meet the whole of their requirements. When the works were completed, it would be unnecessary for a time to use the water of their present streams and wells, and the time would come when it would be cheaper for them to use them again rather than take their third instalment in the third pipe. In the meantime, however, when they had their supply from Wales, they would save the whole £20,000 a year, as they would not have to do any pumping. In respect to the probable increase of the water-rentals, they were proceeding on a sound basis. They had assumed that four millions would be the sum to be provided for; and half a million would be spent annually while the works were going forward. But experience of other towns showed that the expenditure would be much less. The increase in the water-rental was in 1887, 2·56; in 1888, 3·03; in 1889, 3·36; and in 1890, 3·67. Therefore they saw that the increase had been steadily growing, and yet they had only given 3 per cent. to the accountants as the figures on which to base their calculations. They were looking forward in the year 1910, or even in a less period, to making a surplus of £9600; and if the increase should grow in the future as it had in the past, their figures would be enormously improved, and they should have got rid of that little deficiency which appeared in their calculations. He hoped they had proved their case up to the hilt, and that the scheme could be carried out with no special or unnatural pressure upon anyone.

The resolution, empowering the Committee to obtain further reports in respect to the scheme, was then put to the vote, when 51 voted for it and none against it; Mr. Jacobs only remaining neutral.

METROPOLIS WATER SUPPLY.

The Quality of the Water in March.

The returns furnished to the Registrar-General by the London Water Companies as to the water supply of the Metropolis during the past month show that the average daily supply was 173,356,318 gallons, as compared with 164,906,829 gallons in the corresponding month of 1890; being at the rate of 28·8 gallons per head of the population. Of the entire bulk of water sent out, 86,932,572 gallons were drawn from the Thames, and 86,423,746 gallons from the Lea and other sources. Reporting upon the quality of the supply, Dr. E. Frankland said: "Taking the average amount of organic impurity contained in a given volume of the Kent Company's water during the nine years ending December, 1876, as unity, the proportional amount contained in an equal volume of water supplied by each of the Metropolitan Water Companies and by the Tottenham Local Board of Health was: Kent, 0·6; New River, 1·1; Tottenham, 1·5; East London (deep-well), 2·2; do. (river supply), 2·7; West Middlesex and Southwark, 2·8; Lambeth, 3·2; Grand Junction, 3·5; Chelsea, 3·7; and Colne Valley, 5·7; do. on March 31, 1·9. The water abstracted from the Thames by the Chelsea, West Middlesex, Southwark, Grand

Junction, and Lambeth Companies, which was so seriously polluted by vegetable organic matter in February had, in every case, returned to about its normal condition at this season of the year. It was efficiently filtered before delivery. The water taken chiefly from the River Lea by the New River Company ranked, in respect of organic purity, with the best of the deep-well waters; while that of the East London Company, taken from the same source, but lower down the stream, was slightly superior in quality to the best of the Thames-derived waters. Both supplies were efficiently filtered before delivery. The deep-well waters of the Kent and East London Companies, and of the Tottenham Local Board of Health, were of good quality for dietetic use; that of the Kent Company being again especially distinguished for its excellence. On the other hand, the deep-well water supplied by the Colne Valley Company on the 20th contained an abnormal amount of vegetable organic matter. The Secretary of the Company informs me that the fixing of new pump gear in the well occasioned this temporary contamination of the water. Another sample collected on the 31st was of the usual excellent quality of this Company's water; and, having been softened before delivery, was made suitable for washing. All these waters were clear and bright without filtration. Seen through a stratum two feet deep, the Kent and Tottenham waters were clear and colourless; the New River, clear and nearly colourless; the East London (both river and deep-well supplies), clear and very pale yellow; and the remaining waters clear and pale yellow. The bacteriological examination by Dr. Koch's process of gelatine plate culture gave the following results: One cubic centimetre of each water collected in sterilized vacuous tubes, on the same days as the samples for chemical analysis, developed the following numbers of colonies of microbes: West Middlesex, 38; Southwark, 56; Kent, 116; Lambeth, 160; East London (river supply), 214; New River, 230; Chelsea, 278; and Grand Junction, 470."

Messrs. Crookes, Odling, and Tidy, in their report for the past month on the composition and quality of samples of the water supplied to London, say: "Of the 168 samples examined, the whole were found to be clear, bright, and well filtered, excepting three, which were recorded as 'very slightly turbid.' We observed at the conclusion of our previous report [*ante*, p. 608] that towards the end of the month of February the water furnished alike by the several Companies had all but recovered its habitual character, and freedom from turbidity and colour. That this improvement was well sustained throughout the succeeding month of March, is shown by a comparison of the Thames-supply results afforded during that month, with the mean results obtained during the six months from July to December, 1890, distinguished as this period was by the exceptionally high character of the water supply generally:—

Thames-derived Supplies.

		July-Dec., 1890.	March, 1891.
Ratio of brown to blue tint . .	(means)	13·5 : 20 ..	14·1 : 20
Oxygen required for oxidation . .	„	0·049 ..	0·049
Organic carbon per 100,000 parts .	„	0·144 ..	0·146
Do. do.	(maximum)	0·170 ..	0·209

The maximum proportion of organic carbon—namely 0·209 part in 100,000 parts of the water, corresponding roughly to about ¾ grain of organic matter per gallon—was met with in a single sample only; the two next highest results amounting to but 0·162 part and 0·161 part respectively in 100,000 parts of the water."

The Price of Gas in Manchester.—The Mayor of Manchester (Mr. Alderman Mark) has granted the use of his parlour to the Manchester and Salford Noxious Vapours Abatement Association for a meeting of ratepayers on May 1, to consider the advisability of reducing the charge for gas within the city to cost price, with the view of encouraging its use instead of coal for purposes of heating, cooking, and motive power, thereby lessening the present excessive pollution of the air of Manchester. Various other Societies in the city are also arranging for local public meetings, at which resolutions will be submitted in favour of a substantial reduction in the price of gas being made forthwith in the interests primarily of public health and comfort.

Steam-Rollers and Gas-Mains.—At the meeting of the Hackney District Board of Works last Wednesday, a letter was read from The Gaslight and Coke Company, threatening an action against the Board unless the Company were indemnified for the damage caused by an explosion of gas on the 14th inst. at the Grove, Hackney. It appeared that one of the Board's steam-rollers injured a gas-main in the roadway, resulting in an explosion, and considerable damage to the premises near. The Clerk of the Board stated that the matter had been investigated by experts; and he believed the local authorities were liable. It was decided to pay the compensation the Company asked, the amount of which was not stated publicly.

Bombay Gas Company, Limited.—The report of the Directors of this Company for the six months ending Dec. 31 last has been issued, in view of the general meeting of shareholders to be held on the 7th prox. We learn therefrom that the gas and meter rental continues steadily to advance; the increase being £679 12s. 5d., as compared with the corresponding period of the preceding year, while the cost of production has diminished. There is a falling off in coke, tar, fittings, &c., of about £1295. This is partly due to less coke having been produced for sale, on account of the smaller quantity of coal used, and partly from less profit being realized on fittings; as, although a fair amount of business has been done in this department, the articles sold have been of a cheaper class than usual, and less remunerative. The loss on exchange, which amounts to £7164 3s. 9d., has been charged to the profit and loss account. After placing £1500 to the reserve fund, the balance at the credit of the general revenue is £10,068 10s. 6d., from which the Directors recommend a dividend of 4 per cent. (free of income-tax), making, with the interim dividend already paid, 7½ per cent. for the year. This will leave a balance of £468 10s. 6d. to be carried forward. The Directors announce with much regret the death of Mr. Robert King, who was an Auditor of the Company for more than 20 years. Under the Articles of Association, they have appointed Mr. H. E. Jones, M. Inst. C.E., Engineer of the Commercial Gas Company, to fill the vacancy. Mr. Jones now offers himself for the position formerly occupied by Mr. King.

NOTES FROM SCOTLAND.

From our Edinburgh Correspondent.

EDINBURGH, *Saturday.*

What may fairly be described as another check—and a more serious one than that which I mentioned last week—has been sustained this week by electric light promoters in Edinburgh. The Corporation of Edinburgh are at present in Parliament seeking a Provisional Order which will enable them to provide electric lighting, one of the provisions of which is that they may transfer their responsibility to the Gas Commissioners or anyone else. The Corporation of Leith objected to this clause, on the ground that they were joint-owners of the gas undertaking, and that it would be unjust to enable the Corporation of Edinburgh to transfer an Electric Lighting Order for the lighting of the City of Edinburgh only, and to use the assets and revenues of the Gas Commissioners for such a purpose without the consent of the Corporation of Leith. The Board of Trade took the same view as the Leith Corporation; and to satisfy the Board, the clause which wa objected to has been amended so as to provide that the Corporation shall not effect a transfer to the Gas Commissioners without the consent of the Corporation of Leith. As amended, the clause will enable the Corporation of Edinburgh if they see fit, with the consent of the Corporation of Leith, to transfer their powers and obligations to the Gas Commissioners, rather than allow a private company to be established within the city to compete against the public undertaking for the lighting of the city with gas. But of what use will any such transfer be? Before it will be consented to by the Leith Corporation, it cannot be doubted they will require a guarantee that any loss of revenue to the Gas Commissioners will be made good out of the Edinburgh rates.

In the shipping trade, Aberdeen has been one of the hottest centres of the New Unionism; but the movement has not, up till now, penetrated to the gas-works. The organisms which propagate this social malady are, however, of the active order; and if Mr. Smith imagined that his employees would escape the contagion, he was mistaken. On the afternoon of Saturday last, Mr. P. Curran convened a meeting of the gasmen of Aberdeen, with a view to the formation in their midst of a branch of the National Union of Gas Workers of Great Britain and Ireland. He was favoured with only a small attendance, a circumstance which it was endeavoured to cover by abuse of the management of the gas-works. It was said that a system of espionage existed in the works, which made it dangerous for men to attend the meeting; that the men in private were prepared to admit that certain charges were perfectly true, but that they could not afford to implicate themselves to the extent necessary to show the thing up properly; and that the other day a workman was dismissed for giving information which one of these agitators made use of, while another man was also discharged who had no share in the giving of the information. The man who said all this spoke as if a grievance existed; but where it is, I cannot see. The men admittedly have not grievance enough to make it worth their while to speak out; and everyone who knows anything of the modern working man, will understand what this means. They are not loath to speak out even when they have no grievance; and if they had had any expectation that the Union would do anything for them, can anyone doubt that they would have taken advantage of it? On the other hand, if the men having no grievance, Mr. Smith found some of them endeavouring to stir up disaffection among their companions, who shall say that he would do wrong parting with those who admittedly were discontented? If on no higher ground, he would be bound to do so in the interest of the men who are contented, so as to save them from the disasters which the New Unionism has thrust upon so many branches of industry. So much for the local grumbler. Turning to the imported professional disturber, I find that he plied his small audience with arguments similar to those he made use of in Edinburgh recently; but that he also went a good deal further, and placed some figures regarding wages before them. Though Mr. Curran held out the offer that he would establish a branch in Aberdeen if twenty men should join, he only succeeded in getting nine to respond. Aberdeen men are too long-headed to be caught by such statements as that "if the men were willing to organize, the Union would not force them on strike at any time; . . . . but if they had a grievance *which was considered to be legitimate* (the italics are mine), then there was £10,000 of consolidated funds at their backs to carry on the fight." Men who have so little of a grievance that it was not worth their while to attend a meeting to learn how they might obtain a remedy, could scarcely hope ever to be able to persuade the National Union that their grievances were sufficiently legitimate to entitle them to draw upon the £10,000. The contributions of the men in Aberdeen would simply go into the "consolidated fund," and be employed to "back up" men in other places. The incident mentioned above—of the dismissal of two men from the gas-works—was before the Executive Committee of the Aberdeen Trades' Council on Monday night; and the Committee, after hearing a deputation on the subject, appointed a Committee of Inquiry.

The same subject was before the Gas Committee of the Aberdeen Corporation on Wednesday, when a letter from Mr. Leatham, a printer, was read, stating that one of the dismissed men did give him information regarding the working of the new stoking machinery in the gas-works, and that he made use of the information in a letter to a newspaper; but that the other man who was dismissed had no hand in the matter. He asked that this other man, who had been 16 years in the works, should be reinstated. As I anticipated, Mr. Alex. Smith, the Manager of the gas-works, informed the Committee that he did not dismiss the men on account of their giving information; but that about fifteen others of similar standing had been dismissed since these two, in consequence of the introduction of the stoking machinery—younger and more active men being required for the work. Mr. Smith also explained that he had declined to meet a deputation from the Trades' Council on the subject. The Committee approved of Mr. Smith's action; but this decision is not likely to pass unchallenged in the Town Council by the partizans of the men, and consequently it may be heard of there at the next meeting.

From our Glasgow Correspondent.

GLASGOW, *Saturday.*

From the altered and amended Bill of the Partick, Hillhead, and Maryhill Gas Company, in which provision is made for the purchase

of that Company's undertaking by the Glasgow Corporation, it appears that the whole of the area in which the now dissolved Dalmuir, Kilpatrick, and Bowling Gas Company (whose works were acquired by the first-named Company nearly a year ago) supplied gas, is within the statutory gas-supply limits of the Corporation of Dumbarton. Having regard to this important fact, the Glasgow Corporation Gas Committee, at a recent special meeting, came to the conclusion that the Corporation of Dumbarton should be approached with the view of their purchasing and taking over the ground and works which belonged to the last-named Company. They accordingly empowered a deputation of the Committee, with Mr. Foulis and the Clerk, to arrange to have a conference with the Gas Committee of the Dumbarton Corporation on the subject; and also to learn what agreement could be made between that Corporation and the Corporation of Glasgow in the Parliamentary Bill, as to their respective limits of supply, in the event of the former not being disposed to take over the ground and works in question. The conference took place in Dumbarton in the early part of this week; the Glasgow deputation being received very cordially and hospitably by Provost Baptie and his colleagues. The whole of the matters involved were considered at some length; but it was not possible for any final decision to be arrived at by the Dumbarton Gas Committee until the subject had been brought before the Town Council. A special meeting of the Gas Corporation was held last night, when Provost Baptie explained the whole circumstances of the case. An animated conversation took place, in the course of which all the phases of the subject were duly considered; but ultimately it was agreed to delay further consideration of the matter till the next meeting of the Town Council. The opening of this matter has stirred up some points of considerable interest; but there is good reason to believe that the question at issue will be settled in an amicable and friendly manner between the two Corporations. No effort will be spared by Provost Baptie to do everything that is honourable to his own town and Corporation and satisfactory to the Glasgow Gas Corporation.

I am told that the Glasgow Special Sub-Committee on Electric Lighting, after considering the whole subject remitted to them, in the light of the information obtained from all sources, are of opinion and have resolved to recommend that the Corporation should undertake the laying down of the necessary works and plant for generating and supplying electricity for private and public lighting within the compulsory area scheduled in the Glasgow Electric Lighting Provisional Order, the same to be done under such professional advice and superintendence as may be deemed requisite or expedient. In the event of the recommendation being approved of by the Town Council, the Electric Lighting Sub-Committee will forthwith invite tenders from competent contractors for the execution of the various works. It is expected that in the course of the next few days the Electric Lighting Committee will issue the reports they have received from Mr. R. E. Crompton, Professor Jamieson, of the Glasgow and West of Scotland Technical College, and Sir William Thomson, P.R.S.

At a meeting of the Finance Sub-Committee of the Glasgow Gas Trust held this week, it was reported by the Treasurer that his year's collection of gas-rents up to date amounted to £261,693 10s. 9d., as compared with £232,226 9s. 8d. over the corresponding period of the previous year. These figures show that the increase for the current financial year has reached £29,467 1s. 1d., which is almost, if not quite, phenomenal. At the same rate of increase, the excess of gas-rental at May 31, when the financial year closes, will be far beyond that of the year ending on May 31, 1890. Then, again, there is the revenue from the sale of residual products. At March 28 this had reached £87,194 9s. 6d., as compared with £72,922 6s. 6d. for the corresponding period of 1889-90; the increase over a period of almost ten months being £14,272 3s.

The Glasgow East-end Exhibition was formally closed on Tuesday of this week by Lord Aberdeen; and one of the several entertainments which took place in connection with the closing of this very successful undertaking was a supper given on the preceding Saturday evening by Messrs. H. Darwin and Co., in the Cookery Lecture Hall, to the Executive Committee of the Exhibition and a number of other friends, all the viands being prepared in the "Darwin" gas-cookers on the spot. It was announced that the Executive Committee of the exhibition had awarded the gold medal to Messrs. Darwin and Co., by way of signalizing their high opinion of the display of gas-fires, gas-cookers, &c., made in the exhibition, and their great appreciation of the cookery lectures which had come to a close that afternoon.

Chiefly owing to a scarcity of warrants, this week's pig iron market was rather excited; and the price of Scotch iron rose to 44s. 9d. for prompt delivery of the documents. The top price was reached yesterday afternoon; and the closing price in the afternoon was 44s. 5d. per ton cash buyers. For hematite warrants, prices have fluctuated between 48s. 6d. and 48s. per ton; and for Cleveland iron, between 39s. 1½d. and 38s. 10d. per ton.

Other two blast furnaces have been blown in during the week; so that there are now 54 in actual operation, as compared with 85 at this time last year. The stocks held in the public warrant stores are being reduced in extent by about 3000 tons per week.

Any change which has taken place this week in the Glasgow coal trade has been in the direction of higher prices. But there is no gainsaying the fact that business for this season of the year is somewhat disappointing. This is no doubt largely due to the delay to which shippers and consumers are subjected by the coalmasters, the miners, and the railway companies. It was recently proposed to announce a reduction in the rate of miners' wages; but the effort has been without result. Ell coal is selling at 9s. to 9s. 3d. per ton f.o.b., main coal at 7s. 6d., splint coal at 8s. 3d. to 8s. 6d. per ton, and steam coal at 10s. 6d. to 11s. per ton. Dross is plentiful, and easier in price.

Reduction in the Price of Gas at Lowestoft.—Last year the Directors of the Lowestoft Gas Company were obliged to raise the price of gas by 2d. per 1000 cubic feet, to meet the increase in the cost of coal. Seeing that there is likely to be a reduction in this direction, they have now issued a circular to the consumers stating that, after June 24 next, the price will be lowered 1d.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *April* 25.

Sulphate of Ammonia.—The market has become dull, which is perhaps not to be wondered at, in view of the backward state of the season. The unseasonable cold and dry weather is a great bar to any activity in the manure trade; and farmers (especially those on the Continent) owing to great losses suffered in many instances through the severity of the winter, seem little disposed to spend much in the way of fertilizers. In consequence of this, the demand is lagging; but with a change to soft and moist weather, it would not cause surprise to see an impulse given to the trade, and an improved demand for raw material. Prices are meanwhile a little easier; but as shipments continue on a very fair scale, and there is not much offering, it may be asserted that a decline would not have taken place but for the action of weak holders of second-hand parcels getting rid, at unnecessarily low prices, of deliveries tendered. The "bulls" certainly do not seem to have an easy time of it; and the long innings of the "bears" tends to demoralize them. It was stated that down to £11 per ton has been accepted for second-hand parcels; makers realizing 2s. 6d. to 5s. more. Nitrate of soda is also dull; 9s. being the figure quoted on the spot. The market at Hamburg is reported as being at the present time extremely weak.

LONDON, *April* 25.

Tar Products.—There is no important change in the values reported last week. Benzols, however, are the weakest feature; and although nominally 4s. 2d. and 3s. 1d., there seems little, if any, business being done at these prices. On the other hand, the increased production from the enlarged and enlarging carbonizing plants at home and abroad, would indicate a probable weakness in the article before long. Anthracene is distinctly weaker—probably owing to the absence of buyers; but this may be only temporary. Pitch is in fair demand at recent prices. Creosote is very quiet; and carbolic does not show any improvement. Nominally, prices are: Tar, 24s. to 30s. Pitch, 30s. to 33s. Benzol, 90 per cent., 4s. 2d.; 50 per cent., 3s. 1d. Toluol, 1s. 8d. Solvent naphtha, 1s. 7d. Crude naphtha, 1s. 5d. Creosote, 1¾d. Carbolic, 35 crystals, 5¾d.; crude, 60's, 1s. 5d. Cresol, 10d. Anthracene (30 per cent.), "A" quality, 1s. 3½d.; "B" quality, 11d. to 1s.

Sulphate of Ammonia.—There has been no advance during the week; and the price still remains from £11 to £11 5s. per ton, less the usual discount. Gas liquor prices are from 5s. 6d. to 7s., according to position.

The Norwich Town Council and the Gas Company.—At the meeting of the Norwich Town Council last Tuesday, a further report dealing with the affairs of the British Gaslight Company was presented by the Executive Committee. It was stated that, in order to enable the latter to proceed, it was necessary to obtain additional information; and after some discussion, it was resolved that a Special Committee should be appointed to take such steps as they think desirable to investigate the affairs of the Company at the London office or at the country stations, and to consult Counsel thereon, if necessary, as to promoting a Bill for the supply of gas by the Corporation for public and private purposes.

Northern Coal Trade.—Business is far brisker than is usual at this period of the year; and the expected opening of the Cronstadt trade in a few days is likely to increase that activity. Best Northumbrian steam coals are 12s. per ton free on board in the Tyne, with the usual reduction for second quality. Small steam coals are better, at about 5s. The claim of the coal-owners for a reduction in the wages seems odd at this time; but it is due to the lower prices that prevailed last quarter. Gas coal is firmer this week; and for the best qualities 10s. per ton is asked. The local consumption has been, and still is very heavy; and it is expected to grow, for it is probable that the Newcastle Gas Company will increase the number of their retorts in the summer, to prepare for next winter. The shipments of gas coal to the Baltic will now increase. Coking coal and coke are very dull; the inquiry for the latter having fallen off. The price for best blast-furnace coke is about 16s. 6d. to 17s. per ton, free on board; but the lower price seems to be having the effect of increasing the demand. There is no alteration in the price of gas coke; the market being still steady.

The Stockton Corporation and their Gas Stokers.—The discussion at a recent meeting of the Stockton Town Council in regard to the dismissal of men from the gas-works by the Manager (Mr. W. Ford) has led the Secretary of the Northern District of the Gas Workers' Union (Mr. I. Lawson) to write to a local paper on the subject. In the course of his letter he says: "In the winter of 1889-90 all the principal gas companies of the district granted the workmen an eight-hour day. The Stockton men thought they were entitled to the same privileges; and they had a meeting on the question, and came to the conclusion that they would go in for the same. There was a paper brought out by one of the foremen for the men to put on it what they wanted and to sign. Every man working as a stoker at the time signed. In the meantime, the Gas Workers' Union was started in Stockton; but the Manager never met the men, and what was done between him and the men had to be done through the foreman. Now what was done was never mentioned at the Council meeting. The Manager promised the men the eight-hour working day, to commence on the 1st of April, 1890; but the men are still working the long hours, although twelve months have elapsed. The Manager says, had the loyalists acted in the same blackguardly manner as the Union men had done, Stockton would have been in darkness. It was a Union man who moved the resolution, and another Union man who seconded it, and nearly all the Union men supported it, giving the Manager the time that he asked for; and there were 24 stokers on the books, and not five or six as stated at the Council meeting, which the books will prove. As for the men not being stopped because they belonged to the Union, we can produce a man who applied to one of the foremen for work; and he was asked if he belonged to the Gas Workers' Union, because if so he need not apply there. I think this wants looking into."

Coventry Corporation Water Supply.—In connection with the scheme for procuring a further supply of water for the city, the Coventry Corporation have accepted the tender of Messrs. Tilley & Sons, amounting to £3515, to sink a main shaft at Whitley.

The Cantreff Reservoir of the Cardiff Corporation.—The General Purposes Committee of the Cardiff Corporation last Wednesday resolved to recommend the Council to complete the Cantreff reservoir themselves, and to appoint a Manager to superintend the work.

The Water Supply of Oundle.—Last Friday week Colonel J. O. Hasted, R.E., held an inquiry, on behalf of the Local Government Board, into an application by the Improvement Commissioners for the district of Oundle for sanction to borrow £4800 for purposes of water supply and £3200 for sewerage works. The evidence showed that the district greatly needed a supply of pure water.

Trial of the Oxygen System of Purification at the Huddersfield Gas-Works.—One of the paragraphs in the minutes submitted by the Gas Committee at the last meeting of the Huddersfield Town Council stated that they had resolved to adopt the oxygen system of purification at the Leeds Road Gas-Works, and to erect the necessary plant for the purpose; and that, in order to test the desirability of using hydro-oxy oil gas in combination with coal gas, they had decided to procure the necessary plant. The minutes were approved.

The Public Lighting of Newcastle.—A deputation from the Newcastle Town Council recently waited upon the Directors of the Gas Company with reference to the lighting of the public lamps; and as a result, the latter have agreed to light the streets of the city all the year round, allowing so liberal a discount that the cost will be only £430 more than what would have been paid for partial lighting. Had not this arrangement been come to, the city would have been thrown into semi-darkness for six months from the 17th inst.

Sale of Shares.—At a sale by auction last Tuesday at Sheffield, £86 of "B" stock and £86 of "C" stock in the Sheffield Gas Company sold for £373 10s., which is at the rate of 225 per cent. Two £8 10s. "E" shares in the same Company realized £17 10s. per share. A £2 2s. 5 per cent. annuity in the Sheffield Corporation water undertaking was disposed of for £60.——Last Wednesday, Messrs. J. G. and A. Prevost sold at the Auction Mart, Tokenhouse Yard, four £100 paid-up shares in the Lambeth Water Company for £838; two £50 paid-up shares in the same Company for £218; eight £2 10s. annuities, payable by the New River Company, for £555; £257 5s. consolidated stock of the Commercial Gas Company for £667; and £24 15s. new consolidated stock of the Company for £147.

The Conveyance of Vyrnwy Water across the Mersey.—A report has lately been submitted to the Water Committee by the Town Clerk of Liverpool (Mr. G. H. Atkinson) with reference to the temporary pipe-line to be laid across the bed of the River Mersey for the purpose of conveying to the city a supply of water from Lake Vyrnwy. It is stated that the negotiations with the Board of Trade as to laying the pipe-line had resulted in the Board sanctioning the proposal, subject to the amended conditions submitted to the Board by the Deputy Town Clerk on March 6 last, of which the principal are as follows: That the pipes shall be laid for the full width of the river below the bed, and, notwithstanding any shifting of, or alteration in, the bed of the river, shall be maintained below the bed until they are removed; that no concrete or other material shall be put down to form a bed for the pipes; and that all the pipes shall be removed from the bed of the river before Dec. 31, 1892, or before the expiration of such further period as the Board of Trade may sanction. The Committee have instructed their Engineer (Mr. G. F. Deacon) to proceed immediately with the work.

The Water Question at Worcester.—At last Tuesday's meeting of the Worcester Town Council, there was a protracted discussion on the question of extending the water-works; and it resulted in the Water and Sewage Committee being instructed to ascertain the price at which certain pieces of land could be acquired, and the estimated cost of carrying out the following works: (1) The construction of four filters on land belonging to the city, adjoining the present subsiding tank. (2) The construction of a subsiding tank to hold about 6,000,000 gallons. (3) The construction of a subsiding tank to contain 7,500,000 gallons. (4) The construction of a reservoir to hold about 2,000,000 gallons at Rainbow Hill, on land belonging to the city, adjoining the present reservoir. (5) The construction of a reservoir to contain about 100,000 gallons on land at such an elevation as to give an efficient supply of water to those parts of the city at present not sufficiently supplied, and of the necessary mains in connection therewith. The Committee were also asked to recommend a suitable site for the last-mentioned reservoir, and to advise the Council as to the employment of a Water Engineer in conjunction with the City Engineer.

The New Water-Works for Morley.—The ceremony of cutting the first sod in connection with the new water-works which the Morley Corporation are about to construct for the supply of the town, in the Cragg Vale in the neighbourhood of Mytholmroyd, was performed by the Mayor (Mr. Alderman J. Hill) last Saturday week, in the presence of a large number of the inhabitants. The scheme, which was projected by Mr. C. E. Gott, is estimated to cost £100,000. There is to be a reservoir at Withens Clough with a water area of 63 acres, and a storeage capacity of 300 million gallons. The greatest depth will be 65 feet, of which about 15 feet will not be drawn off, but will be used for subsiding purposes. The storeage capacity will be equal to 200 days' consumption of the full supply, in addition to the quantity required for compensation purposes. The conduit will pass through Birstal, Gomersal, Cleckheaton, Clifton, Brighouse, Rastrick, Elland, Greetland, Norland, Sowerby, and Erringden. The pipes will be 15 inches in diameter, and will be generally laid along the roads. The top water-level of the storeage reservoir is 965 feet; and the level of the outlet is 915 feet above the level of the sea. The water-level of the service reservoir to be constructed at Morley is 560 feet. The contractors for the storeage reservoir are Messrs. Fotherby, of Burnley; and for the laying of the mains, Mr. D. Barry, of Nottingham. The Staveley Coal and Iron Company will supply the latter with the pipes. For the past twenty years the town has obtained its supply of water from the Leeds Corporation.

Gas Cookery Lectures.—In the JOURNAL a fortnight ago, reference was made to the series of cookery lectures which Miss Edden was then giving at the Holborn Town Hall for The Gaslight and Coke Company, in conjunction with an exhibition of gas-stoves by various makers. At one of the lectures this lady turned out in an hour, with one of the "Metropolitan" stoves of the Davis Gas-Stove Company, and the consumption of 33 cubic feet of gas, costing 1½d., a dinner consisting of eleven dishes. Miss Edden is about to undertake for the Davis Company a series of cookery lectures at Margate.

The Water Supply of Shipley.—Mr. Arnold Taylor, one of the Inspectors of the Local Government Board, held an inquiry last Tuesday at Shipley into an application by the Local Board for sanction to borrow £10,000 for the purpose of constructing a high-level water-main. In support of the application, the Clerk of the Board (Mr. Booth) said that Shipley possessed an ample supply of water in their storeage reservoir, at an altitude of 846 feet above sea-level; but the service reservoirs at Baildon Bank were 277 feet lower, so that the highest portions of Shipley could not be reached. It was to overcome this difficulty that a new main from the Grancliffe reservoir was proposed. Really, the new main was required for the district of Shipley; but it was no secret that an agreement had been made with Windhill by which that place would be supplied by Shipley instead of Bradford, from Jan. 1, 1893, when the agreement with the Bradford Corporation expired. Here they had to expect the opposition of Bradford; but Windhill had a right to take water from whom they chose; and Bradford had no claim to go beyond their agreement. Indeed, Windhill, under the amalgamation of the two districts, as ordered by the County Council, would be the joint-possessors of the Shipley Water-Works, and would have the right to the same conditions as to supply. The Town Clerk of Bradford, in opposing the application, said this was simply an attempt to oust Bradford as the vendors of water to Windhill. The Bradford Corporation had come to the rescue of Windhill when water was greatly needed; and now they were to be thrown over. It would be no advantage to Windhill to be supplied by Shipley. Indeed, Bradford would not submit to it. They contended that they had acquired the right to supply Windhill; and they would insist on it in perpetuity. Mr. W. B. Woodhead, C.E., gave evidence on behalf of the Local Board.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 787.)

Issue.	Share	When ex-Dividend.	Dividend or Int. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	10 Apl.	10½	Alliance & Dublin 10 p. c.	10	16—17	..	6 3 6
100,000	10	,,	7½	Do. 7 p.c	10	11½—12½	..	6 0 0
300,000	100	2 Jan.	5	Australian (Sydney) 5 % Deb.	100	107—109	..	4 11 9
100,000	20	27 Nov.	8	Bahia, Limited	20	13—15	..	12 13 4
200,000	5	13 Nov.	7½	Bombay, Limited	5	6¾—7¼	..	5 3 5
40,000	5	,,	7½	Do. New	4	5—5¼	..	5 9 1
380,000	Stck.	26 Feb.	12½	Brentford Consolidated	100	217—222	+2	5 10 4
125,000	,,	,,	9½	Do. New	100	158—163	+1	5 13 6
220,000	20	12 Mar	11½	Brighton & Hove Original	20	40—42	..	5 9 6
320,000	20	10 Apl.	11½	British	20	43—45	..	5 0 0
50,000	10	12 Mar.	11	Bromley, Ordinary 10 p. c.	10	18—20	..	5 10 0
39,000	10	,,	8	Do. 7 p. c.	10	13—15	..	5 6 8
328,750	10	13 Nov.	6	Buenos Ayres (New) Limited	10	10—11	..	5 9 1
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	100	100—103	..	5 16 7
150,000	20	26 Feb.	8	Cagliari, Limited	20	25—27	..	5 18 6
550,000	Stck.	10 Apl.	13½	Commercial, Old Stock	100	258—263	+3	5 4 6
130,000	,,	,,	10½	Do. New do.	100	195—200	+1	5 7 6
130,000	,,	30 Dec.	4½	Do. 4½ p. c. Deb. do.	100	121—126	..	3 11 5
557,320	20	30 Dec.	13	Continental Union, Limited	20	49—50	+½	5 4 0
242,680	20	,,	13	Do. New '69 & '72	14	33—34	..	5 7 0
200,000	20	,,	10	Do. 7 p. c. Perf.	20	37—39	..	5 2 6
75,000	Stck.	25 Mar.	10	Crystal Palace District	100	195—205	..	4 17 7
480,000	10	28 Jan.	4†	European, Limited	10	20—21	+½	—
354,660	10	,,	4†	Do. Partly paid		7½ 14½—15½	+½	—
5,470,630	Stck.	12 Feb.	13	Gaslight & Coke, A, Ordinary	100	240—244	..	5 6 6
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	96—99	..	4 0 10
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	253—258	+1	3 17 6
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	120—125	+2	4 0 0
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	175—180	+1	4 3 4
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	100	160—161	..	4 5 4
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	251—256	+1	3 18 1
476,000	,,	,,	—	Do. K, 6 p. c. Prf.	100	152—157	+2	3 16 6
1,061,150	,,	12 Dec.	4	Do. 4 p. c. Deb. Stk.	100	113—118	..	3 7 10
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	122—126	..	3 11 5
908,000	,,	,,	6	Do. 6 p. c. do	100	165—170	..	3 10 6
3,800,000	Stck.	13 Nov.	12	Imperial Continental	100	234—238	..	5 0 10
75,000	5	12 Dec.	6	Malta & Mediterranean, Ltd.	5	5—5¼	..	5 9 1
560,000	100	1 Apl.	5	Met. of Melbourne, 5 p. c. Deb.	100	110—112	..	4 9 3
541,920	20	27 Nov.	6⅔	Monte Video, Limited	20	19—20	..	6 10 0
150,000	5	27 Nov	10	Oriental, Limited	5	9—9½	+¼	5 5 3
60,000	5	25 Mar.	7	Ottoman, Limited	5	4—5	..	7 0 0
166,870	10	26 Feb.	2	Pará Limited	10	3¾—4¼	..	—
420,000	100	3 Nov.	6	People's Gas of Chicago— 1st Mtg. Bds.	100	95—100	..	6 0 0
500,000	100	1 Dec.	16	2nd Do.	100	93—98	..	6 2 5
150,000	10	10 Oct.	10	San Paulo, Limited	10	16—17	..	5 17 8
500,000	Stck.	26 Feb.	15⅓	South Metropolitan, A Stock	100	282—287	..	5 8 0
1,350,000	,,	,,	12	Do. B do.	100	235—240	−2	5 0 0
166,500	,,	,,	13	Do. C do.	100	242—250	+1	5 4 0
678,000	,,	30 Dec.	5	Do. 5 p. c. Deb. Stk.	100	141—145	+½	3 9 0
60,000	5	12 Mar.	11½	Tottenham & Edm'nton, Orig.	5	11—13	..	4 8 5
				WATER COMPANIES.				
729,221	Stck.	30 Dec.	10	Chelsea, Ordinary	100	255—265	−5	3 15 6
1,720,560	Stck.	10 Apl.	8	East London, Ordinary	100	207—212	−1	3 15 6
544,440	,,	30 Dec.	4½	Do. 4½ p. c. Deb. Stk.	100	140—145	..	3 2 0
700,000	50	12 Dec.	9	Grand Junction	50	115—120	−1	3 15 6
708,000	Stck.	12 Feb.	10½	Kent	100	255—265	−10	3 19 3
1,043,800	100	30 Dec.	9½	Lambeth, 10 p. c. max.	100	240—245	−4	3 17 7
406,200	100	,,	7½	Do. 7½ p. c. max.	100	195—200	−2	3 15 0
260,000	Stck.	25 Mar.	4	Do. 4 p. c. Deb. Stk.	100	118—123	..	3 5 0
500,000	100	12 Feb.	12½	New River, New Shares	100	345—355	−7½	3 8 4
1,000,000	Stck.	28 Jan.	4	Do. 4 p. c. Deb. Stk	100	125—128	..	3 2 6
902,300	Stck.	12 Dec.	7	S'thwk & V'xhall, 10 p. c. max.	100	170—180	..	3 17 9
126,500	100	,,	7	Do. 7½ p. c. do.	100	165—170	..	4 2 4
1,155,066	Stck	12 Dec.	10	West Middlesex	100	250—260	−5	3 16 11

† Interim dividend.

GWYNNE & BEALE'S PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM LONDON." TELEPHONE No. 2698.

GWYNNE & CO.,

HYDRAULIC AND GAS ENGINEERS,

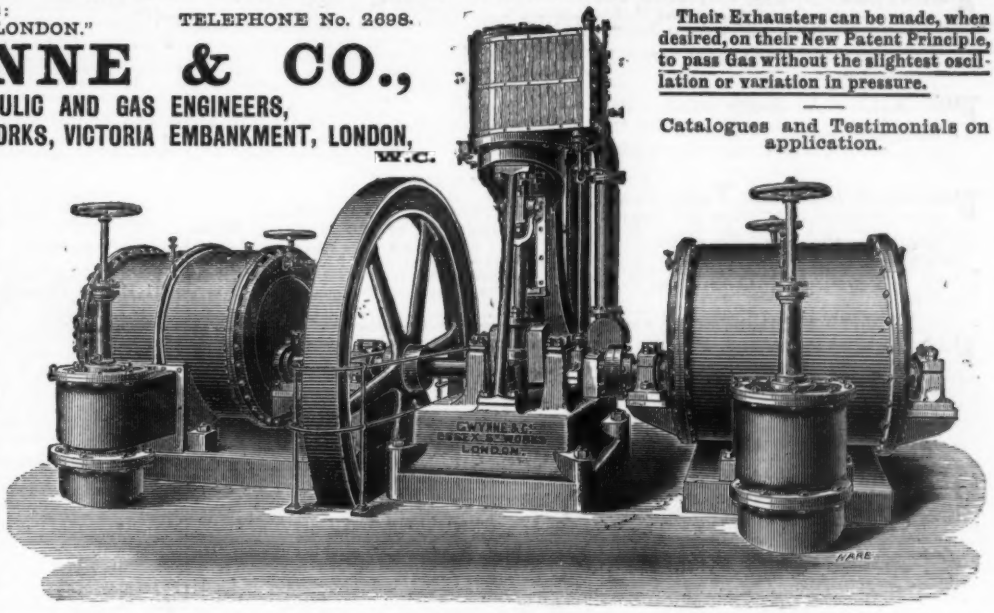
ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C.

Thirty-three Medals at all the Great International Exhibitions have been awarded to GWYNNE & Co. for Gas Exhausters, &c.

They have completed Exhausters to the extent of 29,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, STEAM-PUMPS for Tar, Liquor, or Water; CENTRIFUGAL PUMPS and PUMPING ENGINES, specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH-SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.



Exhausting Machinery at Fulham and Bromley Gas-Works—each set passing 400,000 cub. ft. per hour, drawing 14 miles distant from Beckton.

Their Exhausters can be made, when desired, on their New Patent Principle, to pass Gas without the slightest oscillation or variation in pressure.

Catalogues and Testimonials on application.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.

Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.
JOHN WM. O'NEILL, Managing Director.

ANDREW STEPHENSON, Agent for the GAS PURIFICATION AND CHEMICAL COMPANY, Ltd., Palmerston Buildings, LONDON, E.C.

ANDREW STEPHENSON, Agent for BRIN'S OXYGEN COMPANY, Limited, Westminster, S.W.
City Address: 182, Gresham House, Old Broad Street, LONDON, E.C.

CANNEL COAL, ETC.

JOHN ROMANS & SON, EDINBURGH. Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.
Prices, &c., will be forwarded on application to No. 80, ST. ANDREW SQUARE, EDINBURGH, NEWTON GRANGE, NEAR DALKEITH, } SCOTLAND.

SADLER AND CO., LIMITED, MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 85, Gracechurch Street, LONDON; 70, Wellington Street, GLASGOW; 58, Fountain Street, MANCHESTER; and 96, Reade Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
Head Office: MIDDLESBROUGH. Correspondence invited.

TAR and Liquor wanted. BROTHERTON AND CO., Commercial Buildings, LEEDS.

SITUATION wanted, by a young Man (age 27), as METER REPAIRER and TESTER, at home or abroad. Five years as above in present situation. Abstainer. First-class testimonials as to character and ability.
Address No. 1942, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Situation as Working MANAGER in a Gas-Works making from 7 to 20 million cubic feet per annum. Has had good practical experience in Carbonizing, Fitting, Main and Service Laying, Reading and Testing Meters, and Repairs connected with Gas Plant. Good testimonials and references. Abstainer. Married.
Address No. 1922, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Dry Meter Repairer. Constant work and good Wages given to a good and steady workman. None other entertained.
Apply Mr. T. WRIGHT, Lambert's Yard, Briggate, LEEDS.

JAMES LAWRIE & CO. supply Best SCOTCH CANNEL COALS, Best FIRE-CLAY RETORTS, BRICKS, TILES, and LUMPS; BOILER SEATING BLOCKS, FLUE COVERS, and SILICA BRICKS for SPECIAL FURNACE WORK; COKE BARROWS, BOGIES, and SMALL WAGONS.
Postal Address: 1, WHITTINGTON AVENUE, E.C.
Telegram Address: "EIRWAL LONDON."

W. C. HOLMES & Co., Huddersfield, AND 80, CANNON STREET, LONDON, Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
*** See Advertisement p. 814 of this week's issue.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Address: "Braddock, Oldham."

TUBES.

FOR Gas, Steam, and Water; Galvanized, White Enamelled, and Hydraulic Tubes, &c.
JOHN SPENCER, Globe Tube Works, WEDNESBURY, and 14, Great St. Thomas Apostle, LONDON.

COZE'S Automatic Apparatus for CHARGING AND DISCHARGING GAS-RETORTS. For Illustrated Advertisement of this System, see p. 665.
Inquiries should be addressed to THE AUTOMATIC COAL-GAS RETORT COMPANY, LIMITED, 86-88A, LEADENHALL STREET, E.C.

RAILWAY Tanks on Hire. Address BROTHERTON AND CO., Ammonia and Tar Distillers, LEEDS.

DRAUGHTSMAN wanted, in a provincial Town, for about Two to Three months, accustomed to Gas-Works. State age and salary required, with experience and reference.
Address 1891, care of Messrs. Street, 30, CORNHILL, E.C.

WANTED, by the St. Helens Corporation Gas Department, a GAS-FITTER, used to Stove fixing and Stove-Pipe making.
Applications, stating wages required, and giving references as to character and ability, must be addressed to
SAMUEL GLOVER,
Engineer and Manager.

TO GAS STOKERS.

WANTED, by the Newton Gas Company, a steady and trustworthy GAS STOKER. Must be used to Engine and Exhauster and Shovel Charging. Permanent employment. Eight-Hour Shifts, nine months; Twelve-Hour, three months, yearly. Wages 26s. per week.
Apply, stating age, experience, and giving reference, to J. G. CLARK, Engineer and Manager, Gas-Works, Newton Abbot, DEVON.

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application. OXIDE PAINT, SULPHURIC ACID, & Chemicals.
130 and 121, NEWGATE STREET, LONDON, E.C.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

HUTCHINSON BROTHERS, Barnsley, Gas Engineers and Contractors, Makers of Wet and Dry Gas-Meters and General Gas Apparatus, Sulphate of Ammonia Plant, Lead Saturators, Tanks, &c., Tools and Sundries.

BENTLEY & CO.

MANCHESTER ELECTRICAL STORES.

FOR Batteries, Bells, Wires, and Special Electrical Apparatus, address the best house
17, NEWTON STREET, PICCADILLY, MANCHESTER.

BLACKSMITH and General Handy Man Wanted. Must be steady, *sober*, and industrious. Married man preferred.
Apply, stating age and wages required, with copy of testimonials, to S. BARK, Gas-Works, GODALMING.

GAS-FITTER.

WANTED, a thoroughly good Compo. Worker and GENERAL GAS-WORKS FITTER, Main and Service Layer, and accustomed to taking Meter Indices. Must be steady, *sober*, and industrious. A married man preferred.
Apply, stating age and wages required, with copy of testimonials, to S. BARK, Gas-Works, GODALMING.

COUNTY BOROUGH OF SALFORD.
(GAS DEPARTMENT.)
SUPERINTENDENT OF WORKS.

THE Gas Committee are prepared to receive APPLICATIONS for the appointment of SUPERINTENDENT of their Regent Road Works.
Applicants to state age, salary required, and experience, and to send testimonials, sealed and endorsed "Superintendent," addressed to the Chairman of the Gas Committee, Town Hall, Salford, before Four p.m., on Thursday, May 7.
Only those accustomed to a large Works need apply.
Canvassing members of the Council will disqualify.
SAMUEL BROWN,
Town Clerk.

CANNEL AGENCY.

A GENTLEMAN, with City Office, and good connection among English and Foreign Gas Companies, wishes to arrange TO SELL CANNEL on Commission.

Address, No. 1943, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—A Second-hand 8-inch CENTRE-VALVE with CONNECTIONS, complete and in good condition.

For price, &c., apply to the WATER AND GAS COMPANY, LOWESTOFT.

FOR SALE, very cheap—A second-hand patent ROTARY WASHER, in good condition. Capacity, quarter of a million per diem. Also a STATION GOVERNOR of the same capacity.

For price, &c., either as they stand, or overhauled and put in good working order, apply, by letter, to No. 1937, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

HASTINGS AND ST. LEONARDS GAS COMPANY.

FOR SALE, as they stand, Four 20 feet square PURIFIERS complete, with Lifting Gear, Sieves, &c.; also 15-inch CENTRE-VALVE and CONNECTIONS, and a number of 15-inch and 12-inch GAS-VALVES. Thrown out of use, being too small.

CHAS. E. BOTLEY,
Engineer, &c.

Gas-Works, Hastings, April 14, 1891.

ON SALE—Freehold Manufactory in Birmingham, containing about 1600 square yards of land, about one-half of which is occupied by well-built Workshops, Engine, Boiler, and Stack. On a main road nearly central between two Railway Stations, and only a few minutes' walk from either.

Apply, by letter, to No. 1940, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

COAL.

THE Wellingborough Gaslight Company, Limited, are open to purchase 5000 tons of best screened GAS COAL, delivered at Wellingborough (L. & N.W.R.) during the ensuing Twelve months.

Particulars on application.

S. H. KIMBELL,
Secretary.

PADIHAM AND HAPTON LOCAL BOARD.
(WATER DEPARTMENT.)

TENDERS are invited for the supply of 950 yards of 12-inch, and 250 yards of 6-inch WATER-MAINS.

Further particulars may be obtained on application to Mr. John Greyson, C.E., the Board's Surveyor.

Tenders, endorsed "Tender for Water-Mains," must be sent to me on or before Saturday, May 9, 1891.

By order,
J. R. SMITH,
Clerk to the Board.

Local Board Offices,
Padiham, April 23, 1891.

COUNTY BOROUGH OF BURY.

TO COLLIERY PROPRIETORS AND OTHERS.

THE Gas Committee of the Corporation of Bury are prepared to receive TENDERS for the supply of GAS COAL and CANNEL for One, Two, or Three years, commencing on the 1st day of July next, to be delivered free at the Corporation Siding, Knowsley Street, Bury, in such quantities as may be required from time to time.

Estimated quantity, about 27,000 tons of Coal, and 3000 tons of Cannel per annum.

Full particulars and form of tender may be obtained on application to Mr. Gendall, Manager at the Gas-Works, Elton, Bury.

Sealed tenders, endorsed "Tender for Coal and Cannel," to be sent to me the undersigned on or before Monday, the 18th of May, 1891.

The Corporation do not bind themselves to accept the lowest or any tender.

JOHN HASLAM,
Town Clerk.

Corporation Offices, Bury,
April 27, 1891.

COUNTY BOROUGH OF BURY.

THE Gas Committee of the Corporation of Bury are open to receive TENDERS for the supply of 100 tons of OXIDE OF IRON for Gas Purification, to be delivered free at Bury.

Full particulars and form of tender may be had on application to Mr. Gendall, Manager, Gas-Works, Elton, near Bury.

Sealed tenders, endorsed "Tender for Oxide of Iron," to be sent to me, the undersigned, on or before Monday, the 18th of May, 1891.

The Corporation do not bind themselves to accept the lowest or any tender.

JOHN HASLAM,
Town Clerk.

Corporation Offices, Bury,
April 27, 1891.

ASHFORD, KENT.

TENDERS FOR COAL.

THE Directors of the Ashford Gas and Coke Company, Limited, are prepared to receive TENDERS for the supply of about 3000 tons of GAS COAL, to be delivered on the Siding at their Works, at Ashford, in equal monthly quantities, from the 1st of July next to the 31st of March, 1892.

Tenders, specifying the description of Coals, the Pits at which they are raised, and terms for net monthly payment, to be sent to me on or before May 1.

F. HUGHES-HALLETT,
Secretary.

Ashford, April 17, 1891.

TENDERS FOR TAR AND LIQUOR.

THE Directors of the Victoria New- market Gaslight and Coke Company, Limited, are prepared to receive TENDERS for the surplus TAR and AMMONIACAL LIQUOR produced at their Works during a period of One, Two, or Three years, from the 25th of March last.

Tenders, stating price per 1000 gallons, in Contractor's tanks or barrels, free on Rail at Newmarket, to be sent to the undersigned, on or before the 6th of May next, from whom any further particulars may be obtained.

The Directors do not bind themselves to accept the highest or any tender.

By order,
J. H. TROUGHTON,
Manager and Secretary.

Gas-Works, Newmarket,
April 16, 1891.

TENDERS FOR IRONWORK.

THE Directors of the Victoria New- market Gaslight and Coke Company, Limited, are prepared to receive TENDERS for the necessary IRONWORK for mounting 24 Oval Retorts complete, delivered free at Newmarket Station.

Tenders to be sent to the undersigned, on or before the 6th of May next, from whom all particulars may be obtained.

The Directors do not bind themselves to accept the lowest or any tender.

By order,
J. H. TROUGHTON,
Manager and Secretary.

Gas-Works, Newmarket,
April 16, 1891.

BOROUGH OF BURTON-UPON-TRENT.

IRONWORK FOR NEW RETORT-HOUSE.
CONTRACT No. 9.

THE Mayor, Aldermen, and Burgesses of the Boro gh of Burton-upon-Trent, acting by the Council, invite TENDERS from competent persons for the supply, construction, erection, and fixing of a new RETORT-HOUSE IRON ROOF and other IRONWORK for three Benches of Retorts, &c., at the Gas-Works in the said Borough, and the execution of Works incidental thereto respectively.

Full particulars, and copies of conditions, specification, and bill of quantities, with form of tender, may be obtained and the drawings, viewed on payment of two pounds (which will be returned on receipt of a *bond-fide* tender), on application to the Gas Engineer, Mr. F. L. Ramsden, Gas-Works, Burton-upon-Trent.

Sealed tenders, endorsed "Tender for Ironwork," are to be delivered to me at or before Ten a.m., on Saturday, the 2nd of May next.

The Council do not bind themselves to accept the lowest or any tender, nor will they pay any expense or charge relating to the making or delivery of the same.

T. N. WHITEHEAD,
Town Clerk.

Burton-upon-Trent,
April 16, 1891.

TENDERS FOR GAS-PIPES.

THE Directors of the Sunderland Gas Company are prepared to receive TENDERS for the following CAST-IRON SOCKET PIPES, each 12 feet long *ex* Socket:—

450 24-inch Pipes, each to weigh not less than 22 cwt., at per pipe.
250 18-inch Pipes, each to weigh not less than 14 cwt. 2 qrs., at per pipe.
Bends, Branches, Syphons, &c., at per ton.

The pipes to be delivered free at Sunderland either on the Company's Siding, or at the Goods Station of the North-Eastern Railway Company, as may be directed.

One-third of the straight pipes and all the irregular castings to be delivered within one month after date of order, and the remaining two-thirds within the next two following months.

Each pipe shall be carefully examined and duly proved under the pressure of a column of water 300 feet high; and all defective and unsound pipes shall be rejected, and the same replaced by, and at the expense of, the Contractor.

Tenders, endorsed "Tender for Gas-Pipes," will be received at the Offices of the Company, Fawcett Street, Sunderland, on or before Ten o'clock on Wednesday morning, May 6.

JOHN H. COX,
Secretary.

Sunderland, April 25, 1891.

BOROUGH OF BARROW-IN-FURNESS.

SUPPLY OF COAL AND CANNEL.

THE Corporation are prepared to receive TENDERS, on forms to be obtained at the Office of the Gas-Works Manager, for the supply of screened GAS COAL and CANNEL for One, Two, or Three years from the 1st of July next.

Tenders, addressed to the Chairman of the Gas and Water Committee, and endorsed "Tender for Coal," to be delivered at the Town Clerk's Office not later than Twelve o'clock noon on the 6th day of May, 1891.

The lowest or any tender not necessarily accepted.

By order,
C. F. PRESTON,
Town Clerk.

Town Clerk's Office, Town Hall,
Barrow-in-Furness, April 24, 1891.

BOROUGH OF ROCHDALE.

TO COLLIERY PROPRIETORS AND OTHERS.

THE Gas Committee of the Corporation of Rochdale invite TENDERS for the supply of 40,000 tons of COAL, and 10,000 tons of CANNEL per annum for a period of One or Two years commencing on the 1st of June next.

The Coal offered must be screened Coal or Nuts, free from bats, bind, refuse, or dirt; and the Cannel must also be screened and free from the same objectionable matter.

Forms of tender and any further particulars may be obtained on application to Mr. T. B. Ball, the Manager, at the Gas-Works.

Tenders, stating price per ton delivered at the Rochdale Station, and endorsed "Coal," must be sent to me not later than noon on Wednesday, the 6th of May, 1891.

By order,
ZACH. MELLOR, Town Clerk.

Town Hall, Rochdale,
April 24, 1891.

TO COAL AND CANNEL OWNERS.

THE Directors of The Gaslight and Coke Company are prepared to receive TENDERS for supplies of COAL and CANNEL for One year from the 1st of July next, in accordance with the terms of their Specifications.

The Company's requirements for the above period will be—

For Coal . . . . . 1,750,000 tons.
For Cannel . . . . . 50,000 „

Deliveries can be made either by Ship in the Thames or by the principal lines of Railway which are in connection with the several Works of the Company.

Copies of the specifications and forms of tender can be obtained upon application at this Office; and all tenders must be sent in before noon on Thursday, the 30th inst., addressed to me, and endorsed "Coal Tender."

By order,
JOHN ORWELL PHILLIPS,
Secretary and General Manager.

Chief Office: Horseferry Road,
Westminster, S.W., April 7, 1891.

TO TAR DISTILLERS, MANUFACTURING CHEMISTS, AND OTHERS.

THE Directors of the Rochester, Chat- ham, and Strood Gaslight Company are prepared to receive TENDERS for the purchase of the surplus TAR and AMMONIACAL LIQUOR produced at their Works at Rochester and Gillingham for One year, commencing the 1st of July next.

In 1890, the quantity of Tar was about 300,000 gallons; of Liquor, about 800,000 gallons.

Further particulars may be had on application at the Office of the Company, 58, High Street, Rochester.

Tenders may be for tar or liquor separately or together, and are to be delivered at the Office, marked "Tender for Tar" or "Liquor," not later than Noon of Thursday, the 7th of May.

The Directors do not bind themselves to accept the highest or any tender; and security for due fulfilment of the contract must be given if required.

WILLIAM SYMS,
Secretary and Manager.

Gas Office, 58, High Street, Rochester,
April 9, 1891.

IRON ROOFS.

THE Gas Committee of the Belfast Cor- poration invite TENDERS for the construction of three IRON ROOFS of the following sizes, viz:—

191 ft. 9 in. by 70 ft. span.
60 ft. by 31 ft. span.
106 ft. 3 in. by 26 ft. span.

Drawings and specification may be inspected at the Engineer's Offices, Gas-Works, Belfast. Copy of specification, with form of tender attached, can be had on payment of One Guinea to be returned on receipt of a *bond fide* tender.

For the convenience of parties unable to inspect plans at the works, it has been arranged to supply a complete set of drawings and specification on payment of Three Guineas.

Tenders, endorsed "Tender for Roofs," must be lodged in the Town Clerk's Office, Town Hall, Belfast, not later than the 20th of May.

The Committee do not bind themselves to accept the lowest or any offer.

JAMES STELFOX, Engineer.

Price 3s. 6d. post free (76 Pages, Demy 8vo., Limp Cloth),

THE

VALUATION OF GAS-WORKS FOR ASSESSMENT,

By THOMAS NEWBIGGING, M. Inst. C.E.,

With an Appendix containing a Statement of the most Important Cases bearing on the Question, and decided by the Superior Courts. Each of these is preceded by a Digest; and the Judgments are given in full.

Price: Morocco, Gilt, 18s.; Cloth, 15s.; Delivered Free.

THE FIFTH EDITION OF THE

HANDBOOK

FOR

Gas Engineers and Managers,

BY

THOMAS NEWBIGGING, M. Inst. C.E.

LONDON: WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

BOROUGH OF OLDHAM.

THE Gas-Works Committee invite TENDERS for the TAR and AMMONIACAL LIQUOR to be produced at their different Gas Stations for a period of One or more years, commencing the 1st of July next.

The yearly make of tar is about 6300 tons; and of ammoniacal liquor, about 2,400,000 gallons.

Particulars and forms of tender can be obtained on application to Mr. Herbert Andrew, Gas and Water Offices, Oldham, to whom tenders are to be sent on or before Tuesday, May 5, 1891.

A. NICHOLSON, Town Clerk.

Oldham, April 18, 1891.

CORPORATION OF BURNLEY.

THE Gas Committee of the above Corporation invite TENDERS for the purchase of the TAR produced at their Works for a term of Three or Five years next ensuing.

The approximate quantity of tar will be 3000 tons per annum.

The tar will be delivered into the Contractor's boats at the Gas-Works Wharf on the Leeds and Liverpool Canal.

Tenders, under seal, endorsed "Tender for Tar," stating price per ton, to be addressed to the Chairman of the Gas Committee, and delivered at the Town Clerk's Office, Town Hall, Burnley, on or before Wednesday, the 29th inst.

ROBERT E. FOX, Town Clerk.

THE Directors of the Rochester, Chatham, and Strood Gaslight Company invite TENDERS for the supply of HYDRAULIC MAINS, ASCENSION-PIPES, and other FITTINGS for a Retort-House of 21 through Retorts. (Retort Mouthpieces and Lids not included.)

Copies of specification may be had, and the drawings seen (in usual office hours) at the Office of the Company, 58, High Street, Rochester, or any day after Wednesday, the 6th of May.

The goods are to be delivered free at the Works of the Company, at Gillingham, Kent.

Tenders to be at the Office before Noon on Thursday, the 28th day of May next.

WILLIAM SYMS, Secretary.

April 23, 1891.

COAL, COKE, TAR, SULPHURIC ACID, ETC.

THE Hinckley Local Board are prepared to receive TENDERS for the supply or disposal of the following GOODS over Twelve months:—

GAS COAL—3000 tons delivered in about equal monthly quantities.
CAST-IRON PIPES—2, 3, and 4 inches diameter; open Sockets.
SULPHURIC ACID—30 tons in carboys, 5-ton lots.
SULPHATE OF AMMONIA—20 tons, guaranteed to contain not less than 24 per cent. of Ammonia.
COKE—1000 tons to be taken as made.
TAR—250 tons, delivery by rail or canal into Contractor's vessels.

Forms of tender and full particulars on application.

The Board do not bind themselves to accept the lowest or highest tenders as the case may be, and reserve the right to divide the contracts.

Sealed and endorsed tenders to be sent in to me on or before May 11.

E. H. MILLARD, Manager.

PATENTS, DESIGNS, AND TRADE MARKS ACTS 1883 to 1888.

NOTICE is hereby given, that Daniel Robertson Gardner, of 36, Jamaica Street, Glasgow, has applied for LEAVE TO AMEND the Specification of the Letters Patent No. 20,248 of 1889 for "Improvements in, or connected with, Gas-Lamps."

Particulars of the proposed amendment were set forth in the Illustrated Official Journal (Patents) issued on the 15th of April, 1891.

Any person may give notice (on Form G) at the Patent Office, 25, Southampton Buildings, London, W.C., of opposition to the amendment within one calendar month from the date of the said Journal.

(Signed) H. READER LACK,
Comptroller-General.

RE G. KENT, ESQ., DECEASED, AND OTHERS.

GAS, WATER, AND OTHER SHARES.

MR. ALFRED RICHARDS is instructed to SELL BY AUCTION at the Mart, Tokenhouse Yard, E.C., on Thursday, April 30, 1891, at One o'clock punctually, in lots, 630 ORIGINAL SHARES and a quantity of STOCK in the following Companies:—

Romford Gas Company.
Brighton and Hove Gas Company.
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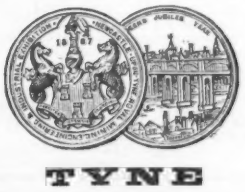

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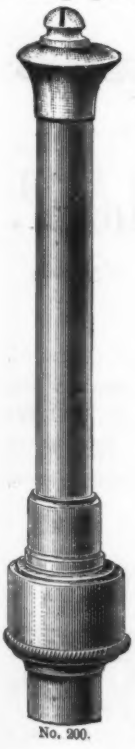

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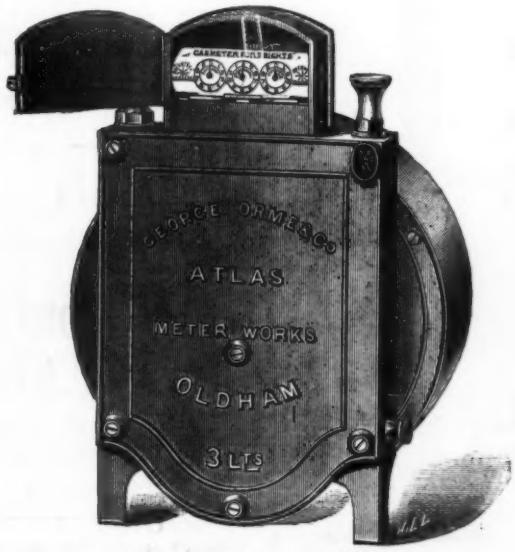

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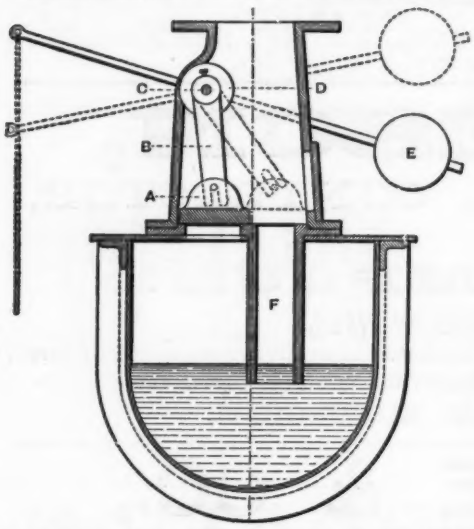

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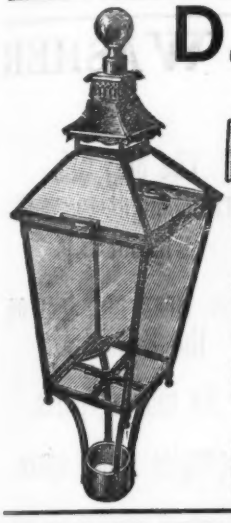

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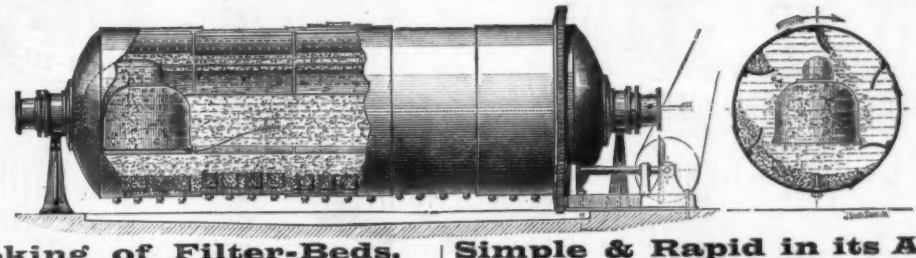

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No more Gas spoilt by over-running the Exhauster.

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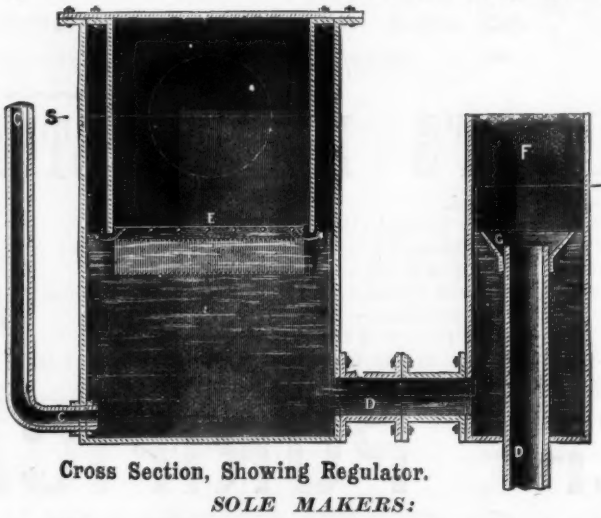

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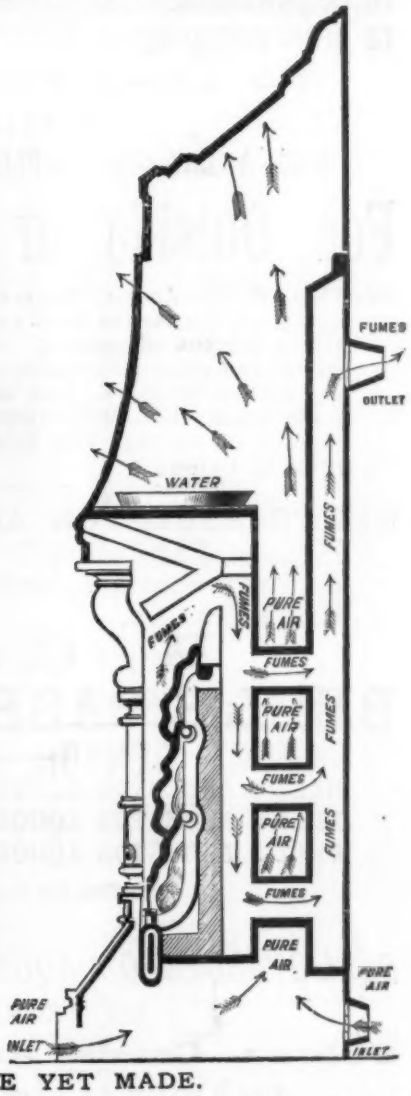

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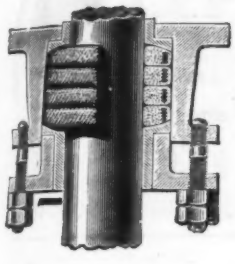

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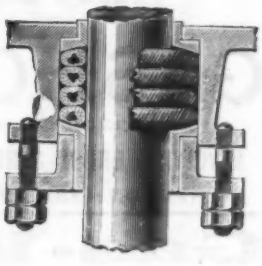

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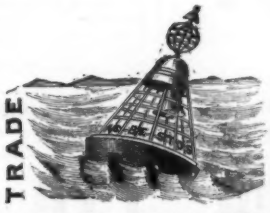

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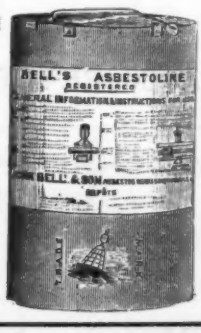

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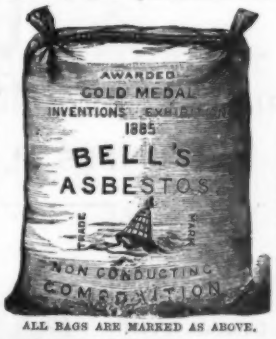

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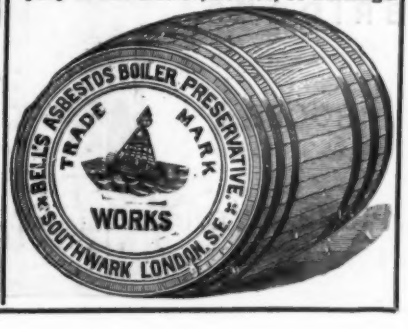

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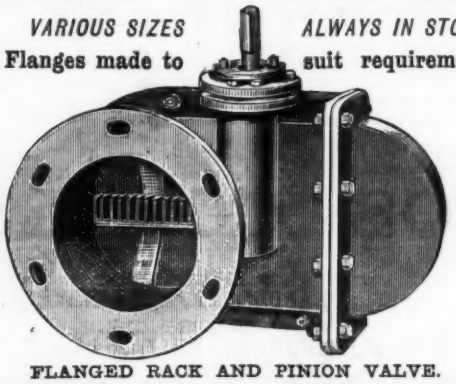

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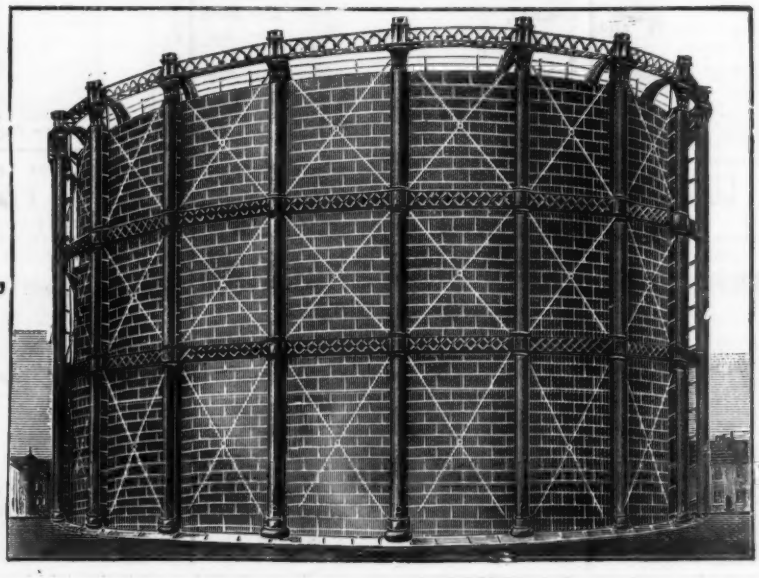

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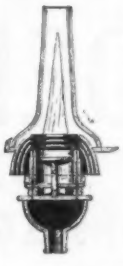

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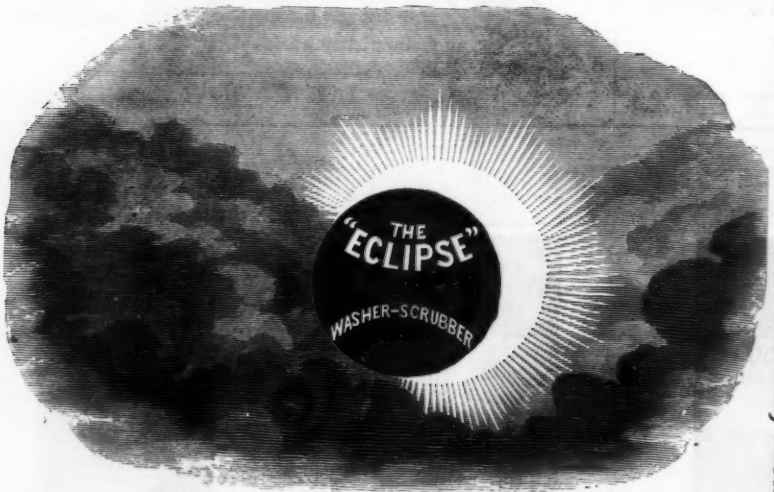

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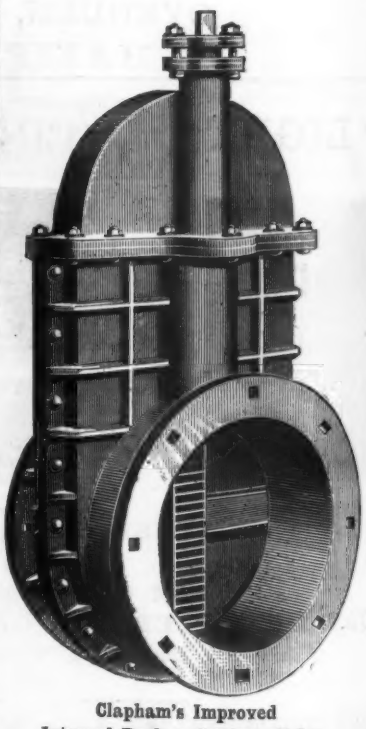

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